BRICS STI Framework Programme
Coordinated call for BRICS multilateral projects 2017

Call is open until 28th November 2017, 17:00 Moscow Time (UTC+3)

I. General Description

I-1. Joint Funding of Multilateral Research Cooperation

The BRICS STI Framework Programme aims to support excellent research on priority areas which can best be addressed by a multinational approach. The initiative should facilitate cooperation among the researchers and institutions in the consortia which consist of partners from at least three of the BRICS countries.

As part of the initiative the following research funding organizations from the BRICS countries have agreed to jointly establish a new scheme for funding multilateral cooperative activities:

Brazil:

National Council for Scientific and Technological Development (CNPq)

Russia:

Foundation for Assistance to Small Innovative Enterprises (FASIE)

Ministry of Education and Science (MON)

Russian Foundation for Basic Research (RFBR)

India:

Department of Science and Technology (DST)

China:

Ministry of Science and Technology (MOST)

National Natural Science Foundation of China (NSFC)

South Africa:

Department of Science and Technology (DST)
National Research Foundation (NRF)
I-2. Aim of the Joint Call and Thematic areas

Collaborative multilateral basic, applied and innovation research projects in the following thematic areas can be submitted in response to the call:

(a) Prevention and monitoring of natural disasters

Human factors such as globalization, population growth, poverty, urbanization and changes in land use are aggravating the negative consequences of natural hazards. Earthquakes and more frequent and intense extreme weather and climate events are also increasing the risks faced by populations living in vulnerable areas. The losses are increasing in BRICS countries. Repeated exposure to disasters is hampering sustainable development in vulnerable localities. Although we have increased scientific knowledge and technology, we have not yet been successful in anticipating and effectively coping with unprecedented natural hazards. We need to identify potential risks, evaluate system vulnerabilities, take action from lessons learnt from past experiences and improve emergency preparedness and capacities to manage crises. At present, international collaboration in disaster risk reduction is not sufficient.

To reconcile the relationships between development, environmental issues, and improved resilience to disasters, important global decisions were made and came to fruition in 2015, with the Sendai Framework for Disaster Risk Reduction (SFDRR) in March. To end poverty and hunger and make human settlement inclusive, safe, resilient and sustainable, it is essential to strengthen capacity for adaptation to climate change and holistic disaster risk management at all levels. It is first of all important to identify, visualize, and evaluate under-recognized disaster risks that hinder sustainable development by taking a holistic view of the changes in hazards, vulnerabilities and exposures arising from societal and environmental problems. Metrics and indicators should be developed for evaluating vulnerability and resilience. Then, effective measures should be taken to anticipate, prepare for, and reduce the consequent disaster risks. It is equally essential to be able to develop response and recovery countermeasures even in the face of disasters and to build capabilities to make proper decisions for action in a timely manner to protect lives, livelihoods, and communities in order to fully recover from the impact of a disaster. Thus, it is critical to construct societies resilient to disasters by improving understanding of natural and human-made hazards, by developing new technologies for disaster prevention, by constantly raising

political and public awareness and by preparing for effective emergency response - including mental and physical health management - and recovery under the concept of “Build Back Better.”

To build such resilient societies, scientists and engineers should develop and practice concrete steps to make full use of science and technology with the following two perspectives. The first perspective concerns the promotion of inter-disciplinary research between natural/applied sciences and humanities/social sciences, the former specializing in understanding disaster occurrence mechanisms and design/maintenance of infrastructure and its functions, and the latter in evaluating disaster impact on socio-economic activities and analyzing human perceptions from the viewpoint of behavioral science. The integration of these two domains should be proactively pursued to enhance the disaster reduction capabilities of humankind. The second perspective concerns the promotion of trans-disciplinary cooperation, which enables the social implementation of science and technology for disaster risk reduction, through effective collaboration with Future Earth, to secure sustainable development. Efforts should be made to develop and strengthen a national platform for disaster risk reduction where scientists and practitioners in each country can work closely together with all relevant stakeholders based on discussions on the actual situations faced by their respective countries in their mother tongues

The priority (thematic) areas addressed in this call for proposals in the BRICS is as follow:

1. Understanding Disaster Risk.

It is critically important to make unflinching efforts for understanding hazards expected to happen and for reducing vulnerability of our infrastructure and society. To make the efforts bear fruit, each country should be supported in

- Collecting and archiving hazard event records and characterizing them with relevant information on land use and socio-economic activities;
- Producing wide-area hazards and its impact data and information with the utilization of satellite observation and numerical modeling;
- Producing reliable disaster statistics will be conductive to allowing each country to make well-informed decision making for disaster risk reduction;
- Improving assessment of disaster risks, monitoring and prediction of changes in disaster risks levels;
- Conducting data integration, analysis and visualization supporting a holistic understanding of disaster processes and consequences;

- Developing new (preferably, fully automated) systems of monitoring and forecasting natural disasters and emergencies.

2. Strengthening Disaster Risk Governance to Manage Disaster Risk.

in order to Strengthen Disaster Risk Governance, Initiatives should provide support in

- How society may curb the increase in disaster vulnerability arising from misguided development activities in land use, construction of infrastructure and housing.
- How individuals, communities and authorities may behave appropriately and be better informed before and during emergencies for protecting their lives, livelihoods and health.

Meanwhile, It is urgent to strengthen international cooperation in the development of monitoring, systems (in situ and from satellite technology), early warning networks and enhanced emergency cooperation during disasters, such as the International Disaster Charter by space agencies. BRICS should also

- Support initiating a forum to discuss practical solutions to reduce disaster risks in line with the Sendai Framework, with all types of stakeholders from all over the world.

(b) Water resources and pollution treatment

Sustainable Water Resources Management and Pollution Treatment are the most important challenges evolved due to ever increasing water stress and water crisis in several regions of the world.

Water is a critical limiting factor for food production and also is pivotal to energy production. It is important to adapt an integrated approach to designing resilient strategies that can account for food, water and energy nexus.

More than 70% of world´s freshwater use is in agriculture with increasing dependence on groundwater. The pressure of water scarcity is expected to increase due to new patterns of consumption by an additional three billion middle-class people by 2030 and the predicted global population exceeding nine billion soon after. The intensive use of pesticides and fertilizers, to enhance agricultural yields, impacts water quality through return flows.

Water Resources Management and Water Pollution Treatment thus form the two focal themes that deserve research and demonstration applications.

Water Resources Management includes STI, inter alia: sustainable water resources management and governance, including optimum withdrawal, conservation by large consumers, transboundary pollution issues, securing safe drinking water, sanitation and hygiene (WASH), technologies for sustained use and reuse of water, optimization of water use in energy production, prevention of water-related diseases, evaporation control technologies, monitoring and mitigation of water- related disasters, climate change impacts on water resources, sustainable management of water ecosystems and rejuvenation of water reservoirs and basins; minimize water loss in distribution and transmission, high capacity cost effective desalination and ICT for water resource management and governance.

Water Pollution Treatment includes STI, inter alia: treatment of agricultural return flows, modular treatment systems for treatment of industrial effluents, decentralized systems for treatment of domestic wastewater, storm and urban runoff, chlorine-free water treatment technologies, nanotechnologies for pollution control and treatment, reuse and recycling of water as a resource, control and treatment of emerging pollutants including Persistent Organic Pollutants (POP´s), control of marine pollution including oil-spills, marine litter, ballast water treatment and seaport waste treatment systems, sea-land interface, including pollution from land based sources.

(c) New and renewable energy, and energy efficiency

To encourage research institutions, enterprises, universities and other relevant entities from BRICS countries to jointly develop collaboration and demonstration projects on new and renewable energy, energy saving, and energy efficiency. The projects may include the water, energy and food security nexus. The priority topics for this call are:

New and Renewable Energy: Photovoltaic Power Generation and System Application Technology; Power electronics for grid synchronization, High Quality Biomass Energy Utilization Technology; New Technology for Energy Storage. New nuclear energy technologies for the minimization of long-lived radionuclides production, environmental impact and for nuclear fuel cycle closure.

Energy Efficiency: Development of Accelerated Life Cycle Models for LED Lamps; Development of Solar Powered LED Lighting Systems with Distributed Batteries; Research on the key technologies of coal to clean gaseous fuel and its environmental

protection to realize clean and efficient coal utilization. Obtaining of new nuclear data to improve the economic efficiency of nuclear power systems, including accelerator driving system.

(d) Biotechnology and biomedicine including human health and neuroscience

One of the hallmarks of XXI century consists in using biotechnology to develop new materials for medicine, novel therapeutics for personalized medicine, long acting drugs, alternative methods to animal testing for non-clinical trials, and in the development of new standards including telemedicine, healthcare of disabled and aging persons. The biotechnological revolution applied to molecular biology, immunology and neuroscience allows to discover new cancer antigens, genetic predictors of the development of disease based on genetic and epigenetic aspects, new antibody based therapies and vaccines for cancer and infection diseases, and new drugs to combat autoimmune neurodegeneration and aging. The following areas can be highlighted for this BRICS coordinated call:

1. Personalized medicine based on genetic and epigenetics to treat cancer and autoimmune diseases, including autoimmune neurodegeneration. Deep sequencing of T and B cell repertoires.

2. Development of new drugs:

• Development of new drugs using combinatorial chemistry and biology, design of new antibody - based drugs for cancer and autoimmune diseases. Biotechnology aspects of therapeutic antibody expression and purification. Development of novel genetically engineered antibodies towards different pathological targets.

• Development of new long-acting drugs based on engineered recombinant proteins. Design of sustained release insulins, cytokines, and hormones.

• Development of new drugs for neurodegeneration, cognitive dysfunction and aging. Telomerase targeted drugs, small molecules and antibodies to treat Alzheimer disease, Huntington disease, Multiple sclerosis.

• Drug repurposing, and development of new drugs and vaccines to cure and prevent infectious diseases including AIDS, Hepatitis, Tuberculosis and neglected diseases.

• Antimicrobial resistance. Investigations of new aspects of drug resistance including antibiotics and anti-viral drugs. Computational drug design.

• Development of new drugs to combat neuro. Design of new approaches for optogenetics, bioimaging.

3. Design of genetically engineered protein constructs for targeted delivery of anticancer drugs. Drug delivery and radiotherapy.

4. New materials for regeneration medicine. Tissue engineering and 3D bioprinting. Development of new principles of material design including computer simulations, polymer material design.

5. Alternative methods to animal testing for non-clinical trials for non-clinical trials using “lab-on-chip” principles. Development of new platforms for drug testing on human cell lines. Validation of experiments using proteomic, transcriptomic and metabolomics approaches.

6. Telemedicine for healthcare. Development of new devices for telemetric investigations of different aspects of human life. Construction of special highly mobile medical vehicles for on-site medical help and development of new approaches and standards in the field of telemedicine.

(e) Information technologies and high performance computing

Within all the BRICS member countries the utility of high performance computing (HPC) systems form an integral part of national development strategies and the deployment of HPC infrastructures occupy a central place. Presently China is the global leader in the HPC industry, with the Tianhe-2 supercomputer, having maintained its leadership of the Top 500 for the past three years. Similarly, Russia has invested significantly in building its own HPC industry with the renowned HPC developer T-Platforms, having deployed its systems not only in Russia itself but also in other developed economies in Europe such as Germany. Recently through the National Scientific Computing Laboratory (*LNCC*) in partnership with Ministry of Science, Technology and Innovation (MCTI) Brazil acquired its first petascale HPC infrastructure, the biggest supercomputer in Latin America, for open use by the academic community. The supercomputer, named *Santos Dumont* places Brazil among

the world's leading group of nations that have HPC capacities. Today, India has 11 supercomputers in the Top 500 and a combined supercomputing power of the nation at 5.25 petaflops. The prevailing view of the Indian government on HPC is that supercomputing must serve not only to improve India's large expanding corporate industrial base, but the country's small and medium business sectors as well. To this end, the Department of Science and Technology and the Ministry of Electronic and Information Technology of the Government of India have launched a National Supercomputing Mission with the Indian Institute of Science, Bangalore and Centre for Development of Advanced Computing (CDAC) as implementing agencies. In South Africa the national government has identified HPC as a critical resource to achieve its objectives of building advanced skills required for the knowledge-based economy and promoting competitive and innovative industries. Through the national Centre for High Performance Computing the country has positioned itself as the leader in HPC on the African continent.

It is clear that within the framework of BRICS there are important opportunities for collaboration in HPC that can be aligned to accelerate the national priorities and goals of BRICS member countries to accelerate scientific discovery and engineering design, minimize the time to create and test new commercial products, lower the cost of innovation and develop high-value innovations that would otherwise be impossible. This call for proposal aims at enhancing HPC driving innovation and interdisciplinary collaboration between BRICS' research organizations through joint development of novel algorithms and software scalable up to exascale computer system for solving grand challenge problems in science, engineering and complex system. The priority topics for this call are:

- Compute in Memory architecture, Silicon Photonics interconnects and development of lightweight Operating Systems, energy efficient computing towards exascale computing
- Development of novel algorithms and HPC software for processing and analysis of big data;
- Development of novel algorithms and HPC software for solving agent-based model with no less than 100 million agents and detailed hierarchical description down to individual status on the basis of physical geographic information system, to predict emerging phenomena of the socio-economic system in BRICS countries;
- Human Capital Development;
- Building Open Source based architecture and tools to enable deployment of HPC systems;

- Open stack developments in Cloud Computing;
- Digital manufacturing (e.g. 3D printing technology for aircraft, ships, nuclear reactors etc.);
- Energy related technology;
- Astronomy, geosciences and environmental engineering; and
- Smart cities.

Under this call for proposals on BRICS HPC cooperation, the following areas are proposed for consideration:

- Human Capital Development for HPC
- Science Data Processing (SDP)
- Development of the HPC industry.

(f) Material science including nanotechnology

The rapid development of five priority directions of science, technology and innovations chosen by the BRICS countries and included in the Moscow Declaration and BRICS science, technology and innovation Work Plan 2015-2018 is impossible without development of such fundamental scientific areas as material science. Creation and research of new perspective materials determines the development of the existing branches of economy and sometimes even the creation of new industries.

Materials for Power engineering: functional and structural materials for more efficient production, storage and distribution of electric energy; functional materials for alternative (bio, hydrogen, solar, wind and ocean) power, advanced catalysts; functional materials for thermal, hydro and nuclear energy; thermo electrical materials and products for waste energy recovery, new composition materials for power industry; materials for improving the reliability and effectiveness of power supply networks and systems.

Nanostructured materials and products: nanodevices and nano sensors; nanomedicine; synthesis of nano-biomaterials and their characterisation for performance; nanomaterials in batteries, fuel cells, super capacitor and hydrogen generation; nano sensors and their fabrication and incorporation in health diagnostic kits; nano catalysis; nano and advanced coatings; nanocomposites; advanced nano bulk materials with improved properties; functional materials with nanoscale dispersion;

advanced nanostructured ferroelectric and related materials, ionic and mixed conductors and biomaterials; new nanostructured materials for sensors and transducers based on multicomponent inorganic crystalline, composite and glassy materials; thin films and phase-change materials for data recording and storage; strongly-correlated and low-dimensional systems.

Magnetic materials: nanostructured magnetically-ordered thin-films and bulk materials with new functional characteristics; new functional materials: multiferroics, helimagnets, magnetic fluids and gels, biocompatible magnetic materials; high-efficiency magnetosensitive medium for physical sensing applications; soft magnetic, hard magnetic, and magnetocaloric materials with desired magnetic structure; exploration of new effects in the dynamics of magnetic domain structures; composite magnetic materials with polymer matrix, etc.

Please note that the thematic areas and type of supported research vary depending on particular participating funding organization. More details can be found in respecting National Annex document (available on http://brics-sti.org/index.php?p=new/15) or from national contact points. However, the general information on thematic areas supported by each of the participating funding organization is presented below:

		Brazil	Russia			India	China		South Africa
	Thematic areas	**CNPq**	**FASIE**	**MON**	**RFBR**	**DST**	**MOST**	**NSFC**	**NRF**
a	**Prevention and monitoring of natural disasters**	V	V	V	V	V	V		V
b	**Water resources and pollution treatment**	V	V	V	V	V		V	V
c	**New and renewable energy, and energy efficiency**	V	V	V	V	V	V		V
d	**Biotechnology and biomedicine including human health and neuroscience**	V	V	V	V	V		V	V
e	**Information technologies and high performance computing**	V	V	V	V	V	V		V
f	**Material science including nanotechnology**	V	V	V	V	V		V	V

I-3. Invitation of Proposals and Prospective Applicants

The participating funding organizations shall invite researchers from their countries to

identify potential partners in at least two other BRICS countries and to jointly prepare proposals for cooperative research projects in the thematic areas of the call.

All applicants must fulfil their respective national eligibility rules for research grant applications (please refer to the National Annex document and consult with national research funding organization participating in the call).

I-4. Financial Support

The participating funding organizations plan to support cooperative activities including exchange of researchers within the participating counterpart countries. Conditions of support will vary by country and respecting national funding organizations' approaches, with a common rule that each participating funding organization funds its national researchers or institutions.

The duration of a cooperative research project will be up to three years with start of projects in 2nd quarter 2018.

II. Application

A joint project will comprise of at least one PI from each of the participating countries, and a project coordinator or the leading PI acting as the project coordinator. Project consortia should consist of partners from at least three of the BRICS countries participating in a specific thematic area of the call.

A **Joint Application Form (JAF)** (link for download: http://brics-sti.org/files/JAF_BRICS_2nd_Call_2017.docx) shall first be submitted by the project coordinator to the Call Secretariat through the online **BRICS STI Framework Programme Application Management System (AMS)** at https://ams.rfbr.ru/BRICS. JAF shall be written in English.
In addition to the JAF, each national team of a project **shall submit an additional national component** (i.e. proposal) to the relevant national participating funding organization following all required procedures of each particular organization.

The Joint Application Form includes information on:

1) Thematic area;
2) Title and acronym of cooperative research project;

3) Abstract;
4) Proposed period of cooperative research project;
5) Research team;
6) Budget requested.

The national component to be submitted shall vary in form, terms and information provided depending on the particular participating funding organization. More details can be found in the National Annex document (can be downloaded from http://brics-sti.org/index.php?p=new/15 page) and on the websites of participating funding organizations.

The project which does not submit in due date a fully completed Joint Application Form to the Call Secretariat through Application Management System (ams.rfbr.ru) or a national components to all respecting national funding organizations will automatically be considered as non-eligible.

II-2. Preparation of Application Forms

Applicants should agree on aims, strategy of research and management, and the title of the project, and agree on the project coordinator. Based on those agreements the applicants should complete the Joint Application Form (JAF) and national component.

II-3. Submission of Application Forms by Applicants

Applicants should submit the Joint Application Form (JAF) to the Call Secretariat through the online application submission form until **17:00 (Moscow Time, UTC+3) on 28th November 2017**.

To submit an application an online-submission form should be completed through the BRICS STI Framework Programme Application Management System (AMS) at https://ams.rfbr.ru/BRICS. The project coordinator should register in AMS, log in and create a proposal for the BRICS STI FP Call 2017. Project coordinator must fill in all the required fields, attach completed JAF to the online submission form and submit an application. The online submission form fields are identical to the information provided in JAF, however the completed JAF as attachment to the online form must be provided (should be uploaded in the respecting section of online submission form).

Applications submitted to the Call Secretariat by any method other than through online

submission form at https://ams.rfbr.ru/BRICS, such as post, fax or telex will be rejected.

An additional national component should be submitted to the respective national funding organization according to its own rules and procedures.

II-4. Receipt of Application Forms by Call Secretariat

Following the online submission of an application, the respecting confirmation message with proposal registration number will be shown in confirmation message. On “my projects” page in AMS the project thereafter will be shown with assigned registration number and status “registered”.

III. Evaluation of Project Proposals

III-1. Evaluation Procedure

Each participating funding organization evaluates all proposals where researchers from its own country request funding from their respective funding organization. Based on the results of the evaluation, a joint decision by the participating funding organizations will be made regarding the selected proposals to be co-funded.

III-2. Evaluation Criteria

The following general evaluation criteria will be considered:

- Scientific quality and innovation of the joint research plan
- Sound project management, methodological approach, feasibility and appropriateness of the joint research plan
- Added value to be expected from the research collaboration
- Balanced cooperation
- Competence and expertise of teams and complementarities of consortium (interdisciplinary / all necessary expertise)
- Appropriateness of resources and funding requested
- Expected impacts: e.g. scientific, technological, economic, societal
- Opportunities for early career researchers
- To encourage the participation and joint research by the business sector.

III-3. Announcement of Decision

Applicants will be notified of the final decision by November 2018 regarding the approved joint projects for funding.

IV. Responsibilities of the PI following Approval of Projects

After the proposals have been approved, the PI and his/her own affiliated institution will observe the following when carrying out the cooperative research and utilising funding:

IV-1. Progress Report

IV-1.1 Progress Report to the BRICS STI Funding Working Group

Halfway through the research period (i.e. after one and a half years), the leading PI shall promptly develop and submit an integrated progress report to the Call Secretariat on the status of the joint research. The report will be reviewed by the BRICS STI Funding Working Group.

IV-1.2 Progress Report to each participating funding organization

All researchers must follow their own funding organizations' rules and procedures.

IV-2. Final Report

IV-2.1 Final Report to the BRICS STI Funding Working Group

After completion of the period of joint research, the project coordinator shall develop and submit within one month an integrated final report to the Call Secretariat on the results of the joint research. The report will be reviewed by the BRICS STI Funding Working Group.

IV-2.2 Final Report to each participating funding organization

All researchers must follow their own funding organizations' rules and procedures.

BRICS STI Framework Programme – Joint Call Secretariat

http://brics-sti.org/

Contact person:
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V. National Contact Points

Applicants should contact the following national contact points for information on each Party's national eligibility rules or support conditions:

Brazil:

National Council for Scientific and Technological Development (CNPq)

CNPq
Conselho Nacional de Desenvolvimento Científico e Tecnológico

Lelio Fellows Filho
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Russia:

Foundation for Assistance to Small Innovative Enterprises (FASIE)

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