



Grand Challenge Fund

Call for Proposals Guidance

Deadline for Project Outline Submission: Sunday, May 23, 2021

Deadline for Full Proposal Submission: TBC

I. General Information

A. Program Description:

The Grand Challenge Fund (GCF) is a key element of the Higher Education Development in Pakistan Project supported by the World Bank and implemented by the Higher Education Commission (HEC). The GCF is anticipated to promote research excellence in strategic sectors of the economy, and will provide funds to selected institutions based upon a competitive, peer-reviewed evaluation of proposals.

GCF will support large, multisectoral/multidimensional research projects. Successful GCF projects are anticipated to be collaborative in scope, with research teams working cooperatively to accelerate research progress for societal impact. Projects are expected to use a systems-type approach in developing the research agenda, where separate projects come together to achieve a broad-based thematic research advance. Projects should include: relevant and cutting-edge research activities and postgraduate student training.

The Grand Challenge Fund is focused on supporting research and innovation in priority thematic areas of national interest, including:

a. **Food Security**, including but not limited to:

Nutrition and Human Capital

- Food security research, its measurement and consequences on human health and capital
- Implementation research to address nutrition problems in Pakistan
- Impact of undernutrition on early child development and potential undernutrition
- Undernutrition (stunting, wasting), risk factors, consequences and potential solutions for Pakistan

- Micronutrient deficiencies, risk factors, consequences & potential solutions for Pakistan
- Cost effectiveness research to address the double burden of malnutrition and nutrition transition (overweight and obesity)
- Employment of different technologies to provide clean drinking water
- Efficient and Integrated Nutrient Management
- Use of genome editing and gene drive for control of insect pests of crop and disease vectors for human and animal diseases
- Development of nutraceutical production from medicinal plants

Crop Production

- Studies on Plant-Microbiome and its relation to plant health and disease
- Bridging yield gap of major crops (Biofortification for enhancing the nutritive value of edible crops and improving crop varieties for high yield, better quality, stress tolerance, diversification, pest- & disease-resistance, climate resilience and nutritional quality)
- Hybrid seed development of vegetables, oilseeds and fodders
- Integrated pest management (IPM)
- Floriculture (export prospects)
- Farm machinery development for crop sowing, intercropping practices, residue management, harvesting and grain drying for small farmer
- Manure/ Compost Production
- Value-added agriculture for rural industrialization

Animal Nutrition and Production

- Breeding models for dairy, beef and small ruminants for livestock farming systems
- Productivity improvement in aquaculture
- Improved management strategies for enhancing reproductive efficiency
- Nutritional interventions (including local soybean production) for reducing cost of production
- Use of genomics and sexed semen for enhancing the quality and quantity of milk and meat production
- Improved methods of silage, hay and feed production at farm level
- Internationally accepted sanitary and phytosanitary measures
- Effect of uncapping of meat and milk pricing on their productivity
- Food (of animal origin) and feed safety
- Improving field efficacy of existing veterinary vaccines and new veterinary vaccines
- Field diagnostic tests (animal-side/ penside)

b. Water Management and Sustainability, including but not limited to:

- Water Quality Monitoring and Control Systems
- Techniques for improving the water quality through well integrated drainage systems and large-scale, low cost, and scalable waste water treatment systems
- Enhancing financing for water sector through rationalizing of water rates and water charges;
- Reducing excessive mining of groundwater through better regulation and pricing mechanisms; and through Innovative socio-technical approaches to water conservation

- Improve water productivity and sustainability: River basin management (IWRM approach) for groundwater management; improving water governance (demand based irrigation, appropriate water pricing, pancho irrigation etc.)
 - Development of Water management equipment/tools/ techniques
 - Techniques to control water charge discharge in soil
 - Recover fresh water from salt water tube well
- c. Sustainable Energy**, including but not limited to:
- Battery and storage technologies (focusing on Thin film solid electrolytes for optical and energy storage applications, Fabrication of high capacity nickel hydride batteries)
 - Efficient and smart grids (focusing on Innovation mechanisms for reduction in transmission and grid losses in legacy infrastructures)
 - Sustainable platforms for urban, rural, and intercity mobility
 - Smart and sustainable energy solutions for urban, rural, and remote areas
 - Renewable energy system development
 - Energy management
 - Biomass/biofuels development from waste
 - Solar Thermal Systems for Comfort Conditioning
 - Low cost hydrogen storing nano materials development with high energy density including aluminum alloys with other metals and their oxides
 - Design of fuel cells of higher power (focusing on Membranes for fuel cells and electro dialysis systems)
 - Energy systems based on solute or salt concentration system
 - Optimal control methods development to maximize energy efficiency
 - New nuclear reactions with better control and safety
 - Oxygen enrichment in air for fuel burning reaction for efficiency improvement
 - Inorganic membranes and modules fabrication study for natural gas purification
 - Energy systems using gas phase cooling systems to save huge amount of water
 - Design and fabrication of hydro, gas and steam turbines in Pakistan
 - Enzymatic scarification of wheat straw for enhancing bio ethanol production
- d. Sociology and Philosophy**, including but not limited to:
- Identity politics: The factors leading to perpetuation of Pakistan's identity crisis and in defining the pathways to robust nation building
 - Gender: The factors responsible for, and the social and economic cost of, the prevailing gender gap and discrimination, and to identify pathways for better gender equality in the country
 - Population: Micro and macro causes and effects of high population growth and on better management of population programs and population
 - History: Olfactory, gastronomy and medicine histories, Ecological history, Social memory, and Oral histories
 - Critical translations of primary textual sources
- e. Development Economics**, including but not limited to:
- Fiscal, monetary and price stability
 - Investment, savings and economic growth

- Export competitiveness and balance of payment fragility as a constraint to stability and growth
 - Employment, skills development and labor market imperfections and interventions
 - Interplay between population growth and economic development
 - Innovation of products for local and foreign market
 - Reverse supply chains
 - Pandemic / disaster resilient economic models and solutions
 - Efficient Industrial Systems Design Technologies
 - Efficient Inventory Control Strategies
 - Smart Quality Monitoring Systems
 - Supply Chain Management
 - Smart Systems for Market Analysis/Forecasting
- f. Urban Planning**, including but not limited to:
- Multidisciplinary approaches to explore and understand connections (or lack of them) between ecology and urban planning, waste management, creative recycling methods, flora and fauna and environment relationships
 - Sustainable urban design
 - Low-cost housing
 - Mobility and transport
 - Planning for and preservation of urban space and life
 - Economic, sociological, and cultural triggers for the planning and creation of second tier (and new) cities and towns
 - Provision of quality of urban life such as issues related to transportation and congestion, waste collection and disposal, water and sanitation, healthcare and education, and law and order
 - Smart cities
 - Solid Waste Management and Recycling Technologies
 - Economical new construction materials
 - Foldable and flexible dye sensitized solar energy harnessing systems
 - Self-cleaning paint development for decomposition of pollutants in air
- g. Climate Change and Environment**, including but not limited to:
- Climate mitigation, adaptation, policy dialogue interventions and disaster management (focusing on climate modelling and disaster surveillance, environment monitoring, geological monitoring)
 - Metro-scale pollution reduction technologies
 - Protection of available trees through artificial intelligence system controls
 - Use of membrane systems for gaseous and water industrial waste treatment
 - Design and development of hybrid membranes and classical system per requirement of site and location
 - Processes identification and development of hospital waste treatment
 - Removal of arsenic and other toxic metal elements from industrial effluents, water underground aquifers.
 - Climate smart agriculture: Adapting agriculture production to climate change by developing climate resilient crop varieties with regard to heat, drought and flooding (especially of wheat and cotton)

h. Information Technology and Telecom, including but not limited to:

- Artificial Intelligence, Cybersecurity, Cloud Computing and Big Data, Cyber Physical Systems, Robotics
- Development and use of education and health-related information and communication technologies such as exploitation of economic and technological impacts of mobile broadband and 3G/4G networks particularly for less literate and largely illiterate populations
- Addressing the disparities in access of technology; development, deployment, and exploitation of 5G networks; 4th Industrial Revolution (4IR) within the Pakistani context
- Scalable models of education and healthcare delivery through the use of ICT
- E-commerce and E-governance applications

i. Innovative Governance and Reforms, including but not limited to:

- Participatory government and its effectiveness (focusing on incentive structures accountability and government responsiveness)
- Civil service reforms
- Judicial reforms
- Effective use of open data (OD) in evidence-based policy making
- Transparency and use of Right to Information (RTI), citizen scorecards, or similar mechanisms for holding the government to account; mechanisms for creating local capacity to provide policy advice in areas of critical national importance

j. Health and wellbeing, including but not limited to:

Public Health Surveillance and Epidemiology

- Investigating cellular and molecular basis of immunity to common infections and outbreaks such as SARS-CoV-2 with a focus on possible interactions with infectious agents endemic to Pakistan
- Utilizing genomic epidemiology to investigate spread of SARS-CoV-2 infections in Pakistan
- COVID-19 and Infectious diseases (biosafety, biosecurity, active surveillance)
- TB, AIDS, Dengue & Malaria (Community engagement & mobilization; resistance strengthening; environmental strategies for vector control)
- Monitoring and management of drug resistance in infectious diseases

Immunology, Diagnostics & Vaccine Technology

- Diagnostics for common infectious diseases and risk factors (research questions surrounding low cost and affordability)
- Vaccines (focusing on technology transfer and indigenization)
- Establishment and scale-up of recombinant vector for expression systems for different target antigens such as, adenovirus vectors, lipid delivery systems.
- Intelligent and point of care diagnostics based on CRISPR-Cas and other emerging technologies

Non-Communicable Diseases, Population Health and Genomics

- Diabetes (developing operational pilots for holistic and integrated, primary care models)
- Cardiovascular diseases (focusing on low cost and affordability)

- Public mental health problems (focusing on its demystification, and trickle down to lower tiers, i.e., primary care setting)

Partnerships are viewed as a key component of Grand Challenge Fund projects. Principal Investigators should be faculty members at research intensive institutions in Pakistan, but should also build a research team capable of completing a comprehensive research agenda over the project lifetime. This research team can include faculty members from the PI's home institution, any other academic institutions in Pakistan, and/or international academic institutions. In addition, where appropriate sectoral stakeholders (private enterprise, including, but not limited to, multinational, regional, national or local Enterprises; Ministries and other public authorities; chambers of commerce; trade groups and professional associations; hospitals; policymakers; and other appropriate stakeholders) can be included in the research team. To take full advantage of the national research capacity, PIs are encouraged to build teams including junior and senior academic staff, as well as both male and female researchers.

Research conducted in GCF projects must address specific challenges associated with the targeted priority thematic areas. A successful GCF funded project must clearly demonstrate a solution or significant progress in addressing a grand challenge of national importance and may result in development of a consensus and coalition for large-scale adoption, deployment, or scaling of the proposed solution in 3-5 years time from the point of award. Results should be disseminated in international peer reviewed journals, as well as to policymakers and stakeholders in relevant disciplines.

The portfolio of awards supported through the Grand Challenge Fund will address the broad range of priority thematic areas. It is anticipated that awards will be distributed at academic institutions across Pakistan, and that a significant proportion of the PIs will be female.

GCF awards will be selected competitively using a merit-based, independent, transparent evaluation and selection process based upon international standards. The process is described in the Sections below, as well as in the full Evaluation and Selection protocol available on the HEC website. In addition, HEC will organize a series of workshops and webinars, as well as develop a list of Frequently Asked Questions (FAQ) regarding the GCF program.

B. Applicant Eligibility

Lead Principal Investigators (PIs) must:

- Be university faculty members (with PhD or FCPS/MCPS/FRCS) from research intensive institution as notified for GCF Call 2020 vide notification no R&D/GCF/01/2020/284 dated January 20, 2020.

[Web Link – List of Research Intensive Universities](#)

Project Team may include:

- A consortia of faculty members from multiple university departments and/or multiple universities
- Private sector participants, particularly when they bring prior IP or capability to the consortium and/or significant deployment, implementation, or scale up capability
- International partners

International collaborations are encouraged:

- When the international partner brings a unique added value to the project team

The detailed eligibility criteria of Institutions are available in the link given below;

[Web Link – Eligibility Criteria for HEC Competitive Research Grants](#)

C. Anticipated Funding Amount:

Budgets for GCF awards may range from Rs. 15-225 million (USD 100 000 – USD 1 500 000), with a maximum project duration of 3 years. Principal Investigators are encouraged to seek co- and complementary financing from other sources. The budget details will be provided as per budget template available on the link given below:

[Web Link – Budget Template for Research Grant](#)

All the budget requests should be consistent with HEC financial rules for Competitive Research Grants available in the link given below;

[Web Link – Financial Rules Governing Competitive Research Grants](#)

D. Due Dates

- **Project Outlines must be submitted to HEC by Sunday, May 23, 2021 (11:59 PM)**
- **Invited Full Proposals must be submitted to HEC by TBD**

II. Proposal Preparation Instructions

A. Basic Guidance

All researchers interested in submitting a proposal for the GCF must first submit a Project Outline to the Higher Education Commission. Those Project Outlines that pass an initial screening will be invited to submit a Full Proposal to the Higher Education Commission.

Project Outlines, and Full Proposals, must be submitted via the HEC online portal.

B. Proposal Formatting

- All invited Full Proposals should use the .docx Full Proposal Template Document as the basis for the submission. The section guidance (in light grey) should be deleted prior to proposal submission.
- Proposals must be submitted in English.
- Full Proposals should include a Table of Contents.
- All sections of the template – either the Project Outline or the Full Proposal - must be completed prior to submission. The list of required sections – and the guidance for the content within each section – is provided in Section III below of this Call for Proposals.
- The page limit for each section must not be exceeded.
- All pages of the proposal should have a page number.
- Proposals should be submitted in 11 point, Calibri font.
- Tables should be completed in the format and length indicated in the relevant Template document (.docx).
- Proposal sections should not include URLs for additional information. Information or documentation beyond that included in the written proposal will not be used in the evaluation process.
- Proposals should follow accepted academic practice in citing references throughout the proposal. References should be numbered sequentially, and listed separately as a required attachment to the proposal. References should be reported in a standard form, and include: the names of all authors; the article and journal title; book title; volume and page numbers; and year of publication. If available, a Digital Object Identifier (DOI) may be provided.

III. Required Proposal Sections

The required sections for the Project Outline submission and the Full Proposal submission are described below. All submissions should address the identified topics for each section. Do not exceed the maximum page limit for each section.

IIIa. Project Outline Submissions

All Principal Investigators interested in submitting a Full Proposals for consideration in the Grand Challenge Fund Call for Proposals must complete and submit a Project Outline. The purpose of the Project Outline is to ensure that submitted proposals are (i) eligible for the competition, and (ii) respond to the thematic priority areas as described in the Call for Proposals. Principal Investigators must complete each section of the proposal as described in the attached link to the Project Outline Template .docx Document.

[Web Link for Outline Proposal Application Form](#)

As noted in Section I, collaborative research teams are anticipated in GCF proposals. It is expected that the Principal Investigator will have had extensive communication with all anticipated partners prior to the submission of the Project Outline, and will have obtained confirmation of participation in the project if it is selected for funding.

IIIb. Full Proposal Submissions

Full Proposals will only be accepted from those Principal Investigators who are invited to submit a Full Proposal following the evaluation of a submitted Project Outline. Principal Investigators must complete each section of the proposal as described in the attached link to the Full Proposal Template .docx Document. The section guidance (in light grey) should be deleted prior to proposal submission.

[Web Link for Full Proposal Application Form](#)

IV. Proposal Submission Procedure

All GCF proposals must be submitted by the Principal Investigator. The Head of ORICs/ Head of Research at the respective Higher Education Institution at which the PI is a faculty member should endorse the submitted project through the appropriate mechanism using the HEC online portal.

V. Evaluation and Selection Process

The selection of Grand Challenge Fund awards will be made through an open, rigorous, transparent, competitive and merit-based process consistent with international standards for funding academic research projects. All Full Proposals submitted in response to this Call for Proposals will be evaluated by independent experts.

The Evaluation process consists of three sequential steps: screening of Project Outlines; Desk Evaluation of the written Full Proposal; and presentation to Expert Panel by short-listed Full Proposals. At each stage, proposals must be invited to proceed to the next stage of consideration.

Va. Project Outline Review

For the Project Outline Review, an administrative review will be undertaken by the Higher Education Commission to ensure that the Principal Investigator and lead institution submitting each Project Outline is eligible to submit a full proposal.

Subsequent to the administrative review, each Project Outline will be assigned to a thematic review panel. The review panels will determine whether the proposed research concept aligns with the GCF program goals and whether the proposal implementation would lead to

a substantive contribution to addressing the socio-economic development issues of Pakistan. Project Outlines that the review panel decides are not competitive at this point will be rejected, and the review panel will provide written comments/justification for the decision.

The remaining Project Outlines will be assigned to two independent evaluators. The evaluators will assess the Project Outline and provide written feedback. Subsequently, all members of the review panel will discuss each Project Outline under consideration, and make recommendations on those to be invited to submit a Full Proposal. All Principal Investigators, whether invited to submit a Full Proposal or not, will receive a copy of the Project Outline evaluations. The identities of the evaluators will be redacted.

Vb. Full Proposal Desk Evaluation

For the Desk Evaluation, Full Proposals will be grouped by thematic area and assigned to a Panel for evaluation. Each Panel will be composed of a team of experts - including international academic leaders and subject matter experts – who will evaluate the written proposals. Each Full Proposal will be independently evaluated by at least two members of the Panel, and additional reviews may be obtained by appropriate subject matter experts.

The expert evaluators will assess each proposal according to a scoring rubric, and will provide written comments on the proposal.

[Web link for the scoring rubric for Desk Evaluation](#)

All members of the Panel will discuss each Full Proposal assigned to the Panel.

Following the Desk Evaluation of Full Proposals, a committee composed of the chairs of each thematic Panel will identify a short list of the top ranked proposals that will be considered in the third stage of the Evaluation process. This short-list will be reasonably balanced across thematic areas.

Proposals recommended for a Higher Level Expert Panel Review should meet the following criteria: the proposal must address a thematic area identified in Call for Proposals; based upon the written proposal, there is a strong likelihood of successful implementation of the proposed project; the project team and the institutional leadership should be capable of implementing the project; and the proposal must achieve a scoring threshold as determined by the evaluators in the Desk Evaluation to ensure quality.

Vc. High Level Expert Panel Review

A High Level Expert Panel will be convened to recommend which short-listed Full

Proposals are selected for GCF Funding.

The focus of the High Level Expert Panel is on assessing in person the capacity of the research team and the host institution to deliver on what is described in the written proposal. This will be accomplished through a presentation by the Principal Investigator and the institution that submitted the short-listed proposal. The presentation team should include: institutional leadership, including the Vice-Chancellor or Rector; the Principal investigator and key members of the consortia; and sectoral partners.

The High Level Expert Panel will assess each proposal according to a scoring rubric, and should offer additional written comments on the proposal.

[Web link for the scoring rubric for High Level Expert Panel Review](#)

Following the completion of presentations by all of the short-listed teams, the High Level Expert Panel will formulate recommendations for the Higher Education Commission on the proposals that should be selected for GCF support.

At the conclusion of the Selection process, the evaluations of each Full Proposal submitted will be shared with the proposing institution. Both the scoring rubric(s) and the written comments will be made available. For the Desk Evaluations, the identities of the expert evaluators will be redacted.

Grievance procedure: In exceptional circumstances, institutions submitting a GCF Full Proposal that was not selected for funding may submit a written Notice of Grievance to the Higher Education Commission within 7 working days of selection results being announced. A Notice of Grievance is permitted only when the institution believes that the proposal was not evaluated fairly or in a reasonable manner.

VI. **Negotiation and Implementation**

Following the Evaluation and Selection process, the Higher Education Commission – through the GCF Program Manager - will enter into negotiations with the PI and the host institution on the following topics.

The final budget for each selected GCF budget will be negotiated following the evaluation and selection process. The budget will depend upon: the proposed research and education activities; the size of the research team; the costs associated with the proposed workplan; the resources required; the capacity of the research team to achieve the results; and the feedback to the PI provided through the Evaluation and Selection process. The negotiation on anticipated results will occur concurrently with the budget negotiation.

Prior to the formal signing of contracts and launch of the selected projects, several critical

elements must be completed: (1) a revision and strengthening of the proposal in response to the comments and feedback provided in the evaluation process; (2) a fiduciary assessment and procurement plan; and (3) an environmental and social safeguards screening and management plan. In addition, a detailed implementation plan for the project must be prepared and approved.

VII. Project Websites

Full details of the Grand Challenge Fund will be available on the Higher Education Commission website available at:

<http://www.hec.gov.pk>

Updated project information will be available at the project website provided below:

<http://www.hec.gov.pk/site/gcf>

Questions regarding the Grand Challenge Fund may be directed to: info-r&d@hec.gov.pk