J-WAFS Water and Food Grand Challenge Grant

2022 Request for Statements of Interest

1. About J-WAFS and this request for statements of interest

J -WAFS catalyzes MIT research, innovation, and technology for ensuring safe and resilient supplies of water and food while reducing environmental impact, to meet the local and global needs of a rapidly expanding and evolving population on a changing planet. At a time when climate change, urbanization, and a growing and evolving global population are together putting tremendous stresses on the world's water and food supplies, solutions-oriented research addressing these most basic human needs is essential. The challenges are tremendous, the systems are complex, and the need for research on science, technologies, policies, and the scale-up of solutions is urgent.

In this context, J-WAFS is launching a **new funding opportunity** for MIT researchers to address a significant "Grand Challenge" problem in water and/or food systems. Going beyond our seed grants, we seek to fund a larger, integrated project that addresses a significant challenge in the area of water and/or food for human need. This funding opportunity targets grand challenges in food and water that can leverage multiple existing areas of expertise, programs, and Institute resources. We wish to identify challenges that can benefit from actionable, solutions-oriented research. Examples of "grand challenges" identified in prior J-WAFS workshops can be found in the addendum.

Cross-disciplinary approaches are highly encouraged. Projects involving collaboration with non-MIT researchers or external stakeholders are encouraged, but please note that the J-WAFS funding itself will be limited to supporting MIT research. This **request for statements of interest** (see Section 5 for details) kicks off our process over the coming months to identify grand challenges in water and food for which MIT capabilities can be marshaled, and to help individuals form teams and craft research objectives and strategies to address these challenges. Following the submission of statements of interest and subsequent workshops, concept papers will be accepted. Finalist teams will be chosen based on those papers and will be invited to submit full proposals.

We recognize that there is potential overlap with topics and teams emerging from the MIT Climate Grand Challenge. While we would avoid funding research explicitly identified by any of the five Flagship projects that emerged from that process, we are open to complementary or synergistic topics. Please contact J-WAFS (see below) if you would like to discuss the eligibility of these or any other topics.

2. Funding and eligibility

Teams must be led by a Principal Investigator who meets one of these two eligibility criteria:

- *MIT professor*
- *Member of the MIT research staff with principal investigator privileges (generally senior or principal research scientist, or senior or principal engineer)*

If you have questions about eligibility, contact J-WAFS (see below).

We anticipate funding one 2-3 year project with a total budget of up to $1,500,000 (overhead free).

3. Proposal Process and Timeline

This funding opportunity has a multi-step process, starting with submission of brief statements of interest describing an impact area, research topic, and/or approach. Based on these, J-WAFS will identify a set of potential topics to advance. Subsequent ideation workshops and J-WAFS input will help assemble a small number of teams to submit concept papers. Following an external review process, two to three final proposals will be invited. The following dates are approximate:

April 26, 2022:	Funding opportunity announced
June 24, 2022:	One-page statements of interest due
July 2022:	Workshops
July/August, 2022:	Team formation
Sept 30:	Team concept papers due
October 31:	Invitations to submit full proposals issued
February 2023:	Proposals due
Spring 2023:	Final funding decisions
Fall 2023:	Research starts

4. Objectives and Review Criteria

J-WAFS will fund one interdisciplinary three-year research project addressing a grand challenge related to food and/or water for human need. Proposals will be evaluated based on the following review criteria:

- The importance of the problem to the human need for water and/or food and the appropriateness and applicability of the research approach to the problem
- The technical merit of the general research approach and specific work plan

- The strength of the team, including complementarity and interaction across disciplines
- Potential for meaningful outcomes, e.g.:
    - relevance to and intended interaction with stakeholders (in formulating and conducting research, disseminating results, and/or implementing or scaling outcomes);
    - technology commercialization or scale up (through licensing, spinout companies, non-profit initiatives, or other open-access solutions);
    - development of a larger follow-on MIT research effort or new MIT initiative.

5. Initial One-pager Requirements

The purpose of the request for initial statements is to identify grand challenge areas and facilitate organization of the workshops for team building. Please include the following in your one-pager statement:

- Identify a water or food security challenge and provide a brief explanation of your proposed project, the expertise needed to address the problem, how it fits this RFP, and the intended outcomes (please aim for 1-1.5 pages).
- **Optional** additional information:
    - List initial PIs and team members and provide 1-2 sentence descriptions of their role on the project
    - Identify additional disciplines or related research that might be incorporated into a larger project

There is no limit on the number of statements that a single PI may submit. Please submit separate statements for each project concept.

Submission process: Please fill out the webform and upload your Statement of Interest here: https://webportalapp.com/webform/jwafs_grandchallenge_soi

Due date: June 24, 2022

Please note: This stage of our process is intended to identify a set of potential "Grand Challenge" areas. We are interested in receiving statements of interest that identify a topic or challenge. If you have a particular research expertise and are interested in participating but don't have a specific grand challenge topic in mind, please email Renee Robins. We will invite you to the interactive workshops that will follow this summer.

6. Contacts

Please direct questions about topics, eligibility, process, etc. to:

John Lienhard, Director, J-WAFS, lienhard@mit.edu
Renee Robins, Executive Director, J-WAFS, rrobins@mit.edu

Addendum: Example Areas of Focus

NOTE: *These are examples and not a list of topics we are looking for, and this list is not meant to be exclusive of other potential topics. Many of these topics are interrelated, reflecting the nature of water and food grand challenges.*

Long term availability of water

- Large-scale modeling and assessment of long-term world water supply: climate resilience, management strategies.
- Ground water mapping (quantifying and qualifying) subsurface water; new technologies for testing and analysis;
- Water reuse, desalination, and purification technologies and strategies; best practices for regulations and management

Water reuse

- Wastewater treatment technologies
- Data analytics for water treatment and distribution systems
- Microbial water and sludge treatment
- Engineered landscapes for improved water management for both sanitation and ecosystem health
- Phosphate recovery
- Monitoring and removal of contaminants of emerging concern (e.g. PFAS, pharmaceuticals, other industrial chemicals), in-situ sensing for membranes and devices, smart membranes
- Public acceptance and adoption
- Techno-economic/marketing/use analysis of options

Safe and accessible drinking water for all

- Clean drinking water for the "base of the pyramid" (including urban and rural poor, both of which lack piped water supply)
- Urban water supply (infrastructure improvements; leaks; leaching; intermittent water supply issues including pollutant intrusion, equity of access)
- Rural/developing areas: access, climate resilience, contamination
- Work in the context of a specific water supply/watershed: living lab for data analysis, public utility collaboration, new monitoring and purification technologies
- Safe water access and water security for disadvantaged communities (e.g., rural communities, urban poor, Native American communities)

Water for food

- Water access for smallholder farmers
- Managing water under climate uncertainty and extreme weather events; technology & policy strategies for resilience

- Advancing efficient irrigation & smart irrigation through technology
- Economic and other strategies to improve water efficiency for agriculture

Soil
- Soil health, soil regeneration, soil mechanics, soil chemistry, variability across regions
- Soil retention, extreme weather and soil loss
- Soil sensors, real-time monitoring, satellite and drone monitoring, data analytics
- Microbiome; biological management of soils; integrate understanding of human biome/plant biome/soil biome interactions, applicability of big data
- Soil for carbon sequestration

Food waste
- Low-cost food preservation/refrigeration for the very poor
- Technologies to reduce farm-to-market spoilage
- Technologies to reduce store-to-consumption spoilage
- Business models to reduce waste on farms, restaurants, grocery stores

Intensification of agriculture for food production, especially for small scale farmers (much overlap with "climate-smart agriculture")
- New crops to help shift developing countries farmers away from subsistence farming
- New approaches to crop fertilization and fertilizer production
- Soil health; soil retention; soil regeneration: testing & analytics, soil mechanics, soil chemistry, role of microbiome, soil variability across regions
- Engineered microbiome strategies
- Data analytics & precision agriculture for soil health and crop productivity
- Land use impacts on agricultural productivity; land as a limited resource
- Increasing food production from the ocean

Agriculture & greenhouse gases
- Technologies and strategies to use agricultural soil for carbon sequestration
- Reducing methane production from livestock
- Alternative protein sources/alternative foods, including oceans as a food production resource

Integrated Modeling & Technology Adoption
- "Consumer reports" for technologies flooding the market for the base of the pyramid
- Develop a grand model that applies social and economic value to other factors to project future change and influence technology development; integrate earth/environment/human body/behavior into model
- Understand how to turn existential threats (like climate change) into concrete motivations for rapid technological and social change to ensure sustainability (learn from Singapore, Israel, the MENA region)