

## J-WAFS Food & Water News

January 2017

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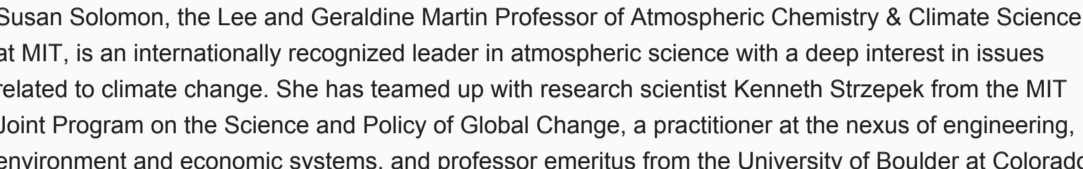
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### J-WAFS Highlight

#### Preparing for Extremes: How Models Can Help Agriculture Adapt to Climate Change Uncertainties

In this month's highlight, we spotlight a project that focuses on climate uncertainty as it relates to water and food sustainability. The concern around climate change has scientists focusing their attention on regions around the world that are expected to be particularly hard hit. One of the most affected areas of the world will be Africa, where the entire continent's survival is at stake. The [Fact Sheet on Climate Change](#) by the United Nations Environment Programme (UNEP) presents the situation: "No continent will be struck as severely by the impacts of climate change as Africa. Given its geographical position, the continent will be particularly vulnerable due to the considerably limited adaptive capacity, exacerbated by widespread poverty and the existing low levels of development." It goes on to quote the 2007 projection by the Intergovernmental Panel on Climate Change (IPCC) that "by 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50%," and that "by 2080, an increase of 5 to 8% of arid and semi-arid land in Africa is projected under a range of climate scenarios."

Africa's vulnerability stems from the fact that so much of the country's economy relies on agriculture, with crops that are mainly rain-fed. It is no wonder that so much of climate change research is focused on this region of the world, racing to devise and evaluate the best strategies for adaptation considering the region's levels of extreme poverty and other constraints.



Susan Solomon, Professor in the Department of Earth, Atmospheric, and Planetary Sciences (EAPS) and Department of Chemistry; Kenneth Strzepek, Research Scientist for MIT Joint Program on the Science and Policy of Global Change; and Amy Dale, postdoc associate in EAPS

Susan Solomon, the Lee and Geraldine Martin Professor of Atmospheric Chemistry & Climate Science at MIT, is an internationally recognized leader in atmospheric science with a deep interest in issues related to climate change. She has teamed up with research scientist Kenneth Strzepek from the MIT Joint Program on the Science and Policy of Global Change, a practitioner at the nexus of engineering, environment and economic systems, and professor emeritus from the University of Boulder at Colorado. Solomon's background on chemistry/climate coupling and anthropogenically-induced global warming, and Strzepek's expertise in modeling of agricultural, environmental, and water resources systems, make them a formidable team. With J-WAFS support, they are using their advanced climate analysis capabilities to inform policy around mitigation and adaptation in the most vulnerable regions of the world.

Climate modeling studies usually produce findings based on worst-case scenarios, but it is difficult for a country's policy makers to plan for the most extreme cases. In addition, these studies are typically based on multiple runs of a single climate model or limited runs from an ensemble of different models. While Professor Solomon acknowledges the usefulness of that work, it doesn't fully address the inherent variability of climate. Weighing the odds of worst-case and best-case scenarios requires more fully "quantifying the noise of variability and the signal of manmade impacts as greenhouse gases increase." And that requires both doing enough modeling runs as well as employing a broader base of models to better assess the risks.

She and Dr. Strzepek are doing just that. Among the first cohort awarded J-WAFS seed research funding for the 2015-2017 period, their project "Advancing Water and Food Sustainability through Improved Understanding of Uncertainties in Climate Change and Climate Variability" involves applying large ensemble-based climate projection modeling to help assess risk and identify adaptation management strategies for vulnerable regions.

In its most recent study, the team implemented a broad mix of large ensembles of global climate models to understand and make projections of crop yields and aridity changes under various climate change conditions. This approach enables the researchers to better identify uncertainties in the results and the sources of these uncertainties. With a focus on maize (corn) yields in Sub-Saharan Africa over the course of the coming century, the intent is twofold: to help identify the potential impacts of climate change on maize production, and to identify adaptation decreases along with their associated costs for Sub-Saharan Africa's agriculture sector. Particularly, they are interested in addressing whether irrigation is an appropriate adaptation option for vulnerable places like Africa, noting that it depends in part on whether the region is expected to become more arid. The results of the study showed agreement across the model runs that: (1) much of southern Africa and some parts of the Western region will experience increasingly severe climate change with widespread decreases in crop yields (correlated with the finding that these regions are becoming arid); and (2) some parts of the Eastern region are likely to experience either little change or higher maize yields due to sub-regional increases in temperature and/or precipitation, or in some locations remain constant.

For Solomon, what's most surprising is the immense range of uncertainty surrounding the outlook for future maize yields in much of Africa, particularly with respect to the variability in precipitation. One of the major outcomes of their work so far is a finding of remarkable agreement across ensembles, supporting their thesis that uncertainty due to the inherent properties of the climate system is a major contributor to the total uncertainty. Amy Dale, a postdoctoral associate evaluating crop impacts and adaptation options, likens this to the "butterfly effect" metaphor, referencing "the old adage about how a butterfly flaps its wings in China...". The practical implication here is the importance for decision makers to evaluate and balance the climate risk and make the most flexible investment decisions with respect to adaptation strategies. The example Solomon gave was "if you build a dam because you're worried about water, you may want to examine not just the average for how much water you will need, but also how much you might need in the worst case, and how little you would need in the best case, and decide how much risk you're prepared to take."

Going forward, they'll be analyzing the impact of irrigation as an adaptation measure in helping combat climate change throughout Africa, along with the potential economic costs and benefits. They also have a concurrent study underway examining how cyclical climate patterns like El Niño affect the models' precision in predicting precipitation, aridity, and maize yields in Africa, the analysis of which could help farmers and policy makers plan for seasonal and inter-annual changes.

Also working on the project is Megan Lickley, a PhD student in the Department of Earth, Atmospheric, and Planetary Sciences. She is evaluating aridity and climate changes in Africa for input to crop models. Chas Fant, a former postdoctoral associate with the MIT Joint Program on the Science and Policy of Global Change, worked on earlier stages of the project.

### J-WAFS News

#### How engineering students are seeking to solve major food and water security problems

**Students with a common passion for food and water security share their research at the MIT Water and Food Security Symposium.**

Seven MIT graduate students studying food and water security issues presented their research and preliminary findings on issues such as these during the MIT Water and Food Security Student Symposium held on Nov. 21. Hosted by the MIT Department of Civil and Environmental Engineering (CEE) and the MIT Abdul Latif Jameel World Water and Food Security Lab (J-WAFS), the event brought together professors and students to discuss food and water challenges and opportunities to address these through research. Chandra Madramootoo, CEE visiting professor and J-WAFS visiting scholar, curated the event. [Read more](#)

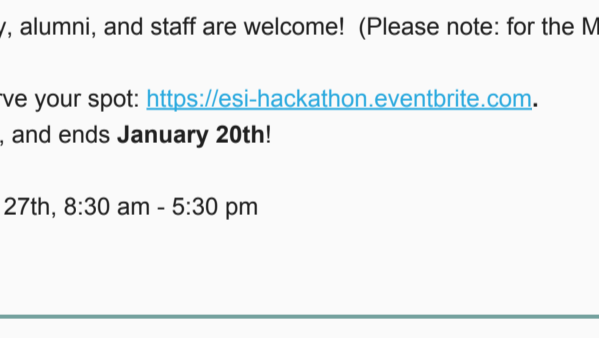
#### Reminder: J-WAFS call for proposals for 2017 seed grants

The J-WAFS 2017 call for proposals for its next round of seed grant funding is currently open. We are seeking proposals that further the overall J-WAFS mission. Only proposals from eligible applicants will be considered; the Principal Investigator submitting the proposal may be an MIT professor or a member of the research staff with principal investigator privileges (generally senior or principal research scientist, or senior or principal engineer). Some specific areas of interest are outlined in the RFP, but proposals on other water & food sector needs are also welcome. Interdisciplinary proposals and proposals with international reach are particularly welcome.

**Proposals are due by 5 pm on Tuesday, January 17.**

### Other Water & Food News

#### Video recordings posted from Forum of Scientific Society Leaders on Genetically Engineered Crops Report



On December 7, 2016, representatives of 15 scientific societies met to explore the findings, conclusions, and recommendations of the report, [Genetically Engineered Crops: Experiences and Prospects](#), which was released earlier this year. In addition to commenting on the reports' conclusions and recommendations, panelists explored how the report might be used in the societies' academic education and public communication activities. The forum panels focused on different sections of the report such as human health effects, social and economic effects, agronomic and environmental effects, and the promise of next generation biotechnology. Watch the video recordings [here](#).

### Upcoming MIT Events

#### MIT Environmental Solutions Initiative presents ESi's 2nd Annual Hackathon for Climate

ESi and Conservation International are teaming up for this year's **Hackathon for Climate**, where minds from across MIT come together to brainstorm, propose, and develop *nature-based solutions* to climate change.

Teams can choose to problem-solve in one of three themes:



1. **Hacking the material world:** minerals and the environmental consequences of extraction, acquisition, processing and distribution
2. **Hacking the digital world:** environmental implications of digital things including data centers and the generation, storage, distribution, and consumption of information
3. **Open track:** for that groundbreaking idea you've been waiting to explore!

All MIT students, faculty, alumni, and staff are welcome! (Please note: for the MIT community only)

Register [HERE](#) to reserve your spot: <https://esi-hackathon.eventbrite.com>.

Registration is required, and ends **January 20th!**

**When:** Friday, January 27th, 8:30 am - 5:30 pm

**Where:** [Building E52](#)

### Boston-area Water and Food Events

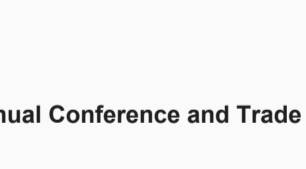
#### NEWIN - Future of Water: 2017

**An evening networking and panel discussion about the incoming Trump Administration's role and impact on the water sector.**

The New England Water Innovation Network is hosting a panel discussion on January 12th with leaders from water investment, water policy, water technology and water services to discuss the Future of Water in 2017. President-elect Donald Trump has outlined a twenty-eight point 100-day action plan that includes items directly related to the future of investment in water innovation and water infrastructure. Join NEWIN over beer and pizza for a discussion of the details of what, who, how, and when.

**When:** Thursday January 12, 2017, 5:00-7:30pm

**Where:** CIC, 50 Milk Street, Boston, MA 02109



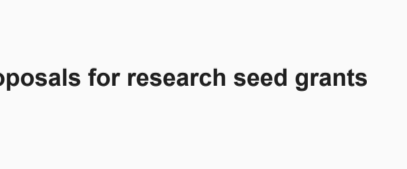
For speakers, more information, and to purchase tickets, click [here](#)

#### NEWEA 2017 Annual Conference & Exhibit

The New England Water Environment Association is an organization of over 2100 water and wastewater professionals located throughout New England that works to promote education and collaboration while advancing knowledge, innovation, and sound public policy for the protection of the water environment and our quality of life. Their annual conference attracts over 2000 engineers, consultants, scientists, operators, and students, and features a variety of technical sessions and over 200 exhibitor displays. The conference provides an opportunity for professional exchange of information and state-of-the-art concepts in wastewater treatment and other water and environment issues. The NEWEA Annual Conference is a great forum to meet colleagues, professional allies, make new friends, and exchange information.

**When:** January 22 – 25, 2017

**Where:** Boston Marriott Copley Place, Boston, MA



For more information and to purchase tickets, click [here](#)

#### Water Innovation Pavilion Tour

**A two-day water-technology showcase will be taking place during Annual Conference and Trade show for NEWEA.**

Take a free guided tour of the NEWIN & NEWEA Water Innovation Pavilion during the annual conference and exhibit. Register for updates and get more details on the tour schedule [here](#).

**When:** January 23 – 24, 2017

**Where:** Boston Marriott Copley Place, Boston, MA

### Funding and Other Opportunities

#### ESi 2017: Funding Opportunities

**MIT Environmental Solutions Initiative announces call for proposals for research seed grants**

2017 - 2019 SEED GRANTS

The ESI Seed Grant Program is designed to encourage MIT researchers to form multi-disciplinary teams to pursue novel environment and sustainability research collaborations that could bring about significant advances. Proposals may be submitted by MIT faculty and research scientists. Proposals focused on problems in ESI's three priority research domains – Climate Science and Earth Systems, Cities and Infrastructure, and Sustainable Society and Economy – are particularly welcome. Awards of up to \$200,000 total over two years are available. Full proposals are due February 17, 2017 by 5:00 pm. See [here](#) for more detailed information.

Attend ESI's Seed Grant research community forum on **Wednesday, January 18th from 3–5pm** to learn more. [RSVP to Hannah Loomis](#). MIT campus location will be sent to registrants.

#### MIT IDEAS Global Challenge

MIT IDEAS is an annual innovation, service, and social entrepreneurship program run by the Priscilla King Gray Public Service Center. Teams can enter early-stage ideas for a chance to receive development grants and feedback on their projects. Winning teams receive grants of up to \$15,000 to pilot their ideas.

Your team must be led by full-time, currently-registered MIT students. We encourage you, however, to collaborate with and involve people around the world to realize your team's vision. There are no sector requirements for IDEAS; however, teams must demonstrate that their project has a strong community service and social impact focus, in areas such as water & sanitation, agriculture, energy & environment, and emergency & disaster relief.

**Upcoming dates and deadlines**

**Thursday Jan 19th @ 6pm** is the second deadline for entries to the MIT IDEAS Global Challenge. We're looking for early-stage projects that can be piloted to have a positive impact on communities in the US or abroad. This is your team's chance to apply for a development grant (up to \$1,500 for the Jan 19th Entry Round) for your idea, and to get feedback on your proposal. Teams must submit their proposal in at least one of three entry rounds to be considered for the Finals. Start working on your proposal [here](#).

Want to recruit additional team members? Looking for a chance to pitch your idea and network? Attend the IDEAS **Generator Dinner on Thursday, February 9th, 7-9pm**. More information [here](#).

#### EPA's P3 Student Design Competition - Open Until 2/3/16

EPA's [P3 \(People, Prosperity, and the Planet\) Student Design Competition](#) is a two-phase program in which interdisciplinary teams of undergraduates, often with graduate student involvement, and faculty leadership develop innovative technology projects that help solve environmental problems in a sustainable manner.

The annual Phase I solicitation opened on 12/5/16 and will close on 2/3/17 (11:59 pm).

The URL for the solicitation is: <https://www.epa.gov/research-grants/14th-annual-p3-awards-national-student-design-competition-sustainability-focusing>

