This January, 2500 delegates and 70 world leaders from 100 different countries braved the heaviest snowfall in decades to meet in Davos, Switzerland at the World Economic Forum (WEF). The extreme weather provided an apt backdrop for the sessions ahead, which were focused on the blizzard of social, economic, and environmental challenges that can be seen across the globe, and which included the issue of extreme weather events driven by climate change.

Driving the content for the week’s discussions was the WEF’s recently released Global Risks Report, which compiles the results of a survey of 1,000 experts and decision makers who weigh 30 global risks against the present geopolitical climate to rate their likelihood and potential impact across a 10-year horizon. This year, environmental risks were at the forefront, with water crises singled out as the fifth greatest global risk, behind weapons of mass destruction, extreme weather events, natural disasters, and failure of climate change mitigation and adaptation.

Water crises do not exist in a vacuum, however. Water is, in fact, intrinsic to many of the global risks singled out by the WEF in the report, including the failure of climate change mitigation, food crises, biodiversity loss, involuntary migration, spread of infectious disease, and various others. The report’s executive summary acknowledges the inability of a ranked list to capture this complexity: “Humanity cannot deal with the multiplicity of challenges we face either sequentially or in isolation,” write the WEF’s executive chairman, Klaus Schwab, and president, Børge Brende. They follow with a call to action:

“Just as global risks are increasingly complex, systemic, and cascading, so our responses must be increasingly interconnected across the numerous global systems that make up our world.”

At J-WAFS, we are deeply aware of the way water flows through multiple global-scale challenges. This is one of the
drivers of our interdisciplinary approach, and a reason that MIT—an institution where collaboration across disciplines is commonplace—is a particularly exciting seedbed for solutions-oriented research in water and food.

Take water’s relationship to number 4 on the list: the failure of climate change mitigation and adaptation. One J-WAFS-funded project could prove influential. Susan Solomon, an MIT professor and leader in the field of atmospheric science and member of the Intergovernmental Panel on Climate Change (IPCC), and Kenneth Strzepek, an MIT research scientist whose work in engineering, water resource planning, and management has had global influence, have developed an agricultural model that estimates crop production in Africa based on water, soil quality, and temperature stressors connected to climate change. The data used in this model represent 122 possible climate futures; the resulting observations provide more precise projections regarding the climate change impacts across Africa. Using this model, the team can assess both yield projections for a variety of crops, as well as the influence of climate change on water resource limitations more broadly. In one application, the research team has integrated its crop model with one for water resource management to project water availability and demand in the largest river basins in Africa: the Congo, Niger, Nile, Senegal, Upper Orange, Volta, and Zambezi. The results outline regional and national trends in water availability in response to the simultaneous pressures of climate change, population growth, expanded hydropower, and expanded irrigation. The knowledge gained from these results could help regional policy makers plan more resilient agricultural practices and water infrastructure systems that more effectively adapt to climate change.

Image from 2017 California research trip (Credit: Nick Hagerty)

As the previous example makes clear, the connection between water and food crises, ranked seventh on the list, is obvious. Water is essential for our food systems from farm to table. Several J-WAFS principal investigators (PIs) are developing tools that promote increased resilience to combat these overlapping crises. One example is Christopher Knittle, a professor at the MIT Sloan School of Management, who is using California as a test site to examine how the creation of water markets could improve water resource management, increase efficiency, and decrease local and regional conflicts over use of this shared resource. Another is mechanical engineering associate professor Kripa Varanasi, who is developing a new agriculture spray that uses charged molecules to improve agricultural pesticide application practices and prevent pollution of soils, surface water, and groundwater. Then, Stephen Graves, a professor at the Sloan School of Management, and Bish Sanyal, a professor in the Department of Urban Studies and Planning, are teaming up to evaluate how agricultural extension services influence the adoption of—or lack of access to—irrigation technologies by small farms. Their current focus is Senegal, where they will evaluate the extent to which private firms with knowledge of irrigation technology can supplement public efforts to expand irrigation to smallholder farms to protect against drought and increase yield.

Tenth on the WEF list is the spread of infectious disease, for which water can be one of various possible carriers. One J-WAFS-funded project seeks to meet this challenge through a small-scale, affordable solution for rural, off-grid communities. This technology has been developed through a collaboration between mechanical engineering associate professor Rohit Karnik and Amy Smith, founder of MIT D-Lab. The team has created a water filter made from tree xylem, a sustainable renewable resource. Applying the community-centered design strategy for which D-Lab is known, the team has developed a prototype where small slices of wood xylem fit into a device that can effectively filter bacteria from drinking water. What is more, the design, once perfected, will be open-sourced. People from any area that is in need of safe, accessible, and affordable drinking water will be able to use these designs to build and grow businesses around the xylem filter so that both the health and economic benefit of this technology stays local.

The WEF report’s Risk-Trends Interconnections Map (detail at the top of this article) illustrates the web of connections among the 30 crises highlighted at Davos. It paints an overwhelming picture. If you imagine the colored diamonds as beads, clearly pulling on one would put a strain on all of the others, with potentially disastrous results. Now imagine another web of equal scale, this one of solutions. Many beads with numerous interconnected threads would be needed to truly reduce or remove these global risks from the horizon. J-WAFS joins individuals and institutions across the globe who are strengthening and expanding this web of solutions. Our approach is to fuel a research community that channels MIT resources toward global water and food systems challenges.

MIT Water and Food Opportunities

Catie Lee, Manager at Land O’Lakes SUSTAIN, on Sustainability in Food and Agribusiness

Join the MIT Food and Agriculture Club for a lunch discussion with Catie Lee of Land O’Lakes SUSTAIN, a business unit that empowers farmers to make sustainable, innovative, and productive decisions. Lee will talk about her career path, the
challenges of sustainability roles in corporations, and specific issues in agriculture and sustainability. More info...

When: March 12th, 11:45 - 12:45 PM  
Where: MIT campus, E51-361  
*This opportunity is open beyond MIT*

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**Achieving Water Affordability in America's Shrinking Cities**

Join a team of MIT researchers from the Department of Urban Studies and Planning for a sustainability lunch seminar focused on drinking water affordability and safety in the US. The team will present current challenges and offer solutions from the perspective of environmental injustice, infrastructure planning, and social equity. More info...

When: March 15th, 12 - 1 PM  
Where: MIT campus, 34-401A  
*This opportunity is open beyond MIT*

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**Call for Papers: New Uses for Old Rivers: Rediscovering Urban Waterways**

The MIT Press seeks submissions for an upcoming issue of *Projections*. This issue will collect papers that examine how revitalized and restored rivers in the global north and south are becoming restorative, accessible, urban "blue space." Papers examining how these rivers have been transformed, and how they are used for recreation, food production, biodiversity cultivation, floating home construction, and cultural and artistic expression are welcome.

Abstract submission deadline March 15th; paper submission deadline July 15th. More info...

*This opportunity is open beyond MIT*

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**Water in Space and Other Art/Science Explorations**

The MIT Water Club will celebrate World Water Day with Water Night, a public, family-friendly event featuring art, science, and technology. Hear MIT professor of aeronautics and astronautics, Jeffrey Hoffman, deliver a keynote address on water in space, talk with MIT students about their latest research, and view films, installations, and participatory art projects by artists that all address challenges, solutions, and beauties of our world’s water systems. Interested in volunteering? Contact water-night@mit.edu. More info and registration...

When: March 22nd, 6 PM  
Where: Walker Memorial, 142 Memorial Drive, Cambridge, MA  
*This opportunity is open beyond MIT*

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**Save the Date: MIT Water Innovation Prize Final Pitch Night**

Attend the MIT Water Innovation Prize final pitch night in April to hear emerging student entrepreneurs present ideas for new water industry innovations and start-ups, from engineering and product design to policy and data analytics. Winning teams will be selected by a panel of judges to win $30,000 in cash awards. More info...

When: April 4th, 6 PM  
Where: MIT Media Lab, 6th floor  
*This opportunity is open beyond MIT*

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**Save the Date: Rabobank-MIT Food and Agribusiness Innovation Prize Pitch Night**

Join the MIT Food and Agriculture Club for the third annual Rabobank-MIT Food and Agribusiness Innovation Prize, sponsored by Rabobank and supported by J-WAFS. This premier student business-plan competition will provide eight finalist teams from across the US the opportunity to compete for $25,000 in cash awards. More info and RSVP...
Apply for the MA Tech Transfer Food Forum

The Massachusetts Technology Transfer Center welcomes applications for its upcoming forum showcasing research discoveries and emerging companies working on food and food-related technologies. Interested presenters with new work in food and health, medical nutrition, food safety, packaging, and food production technologies are encouraged to apply. Application deadline March 31, 2018. More info...

Master of Science in Sustainable Water Management @ Tufts

The Tufts Institute for the Environment has launched a masters degree program to prepare students to take the lead solving complex global water issues. This interdisciplinary 12-month program starts in September. Application deadline April 1st, 2018. More info...

Apply for a MassCEC Catalyst Program Award

The Massachusetts Clean Energy Center seeks applications for awards to commercialize clean energy and water technologies developed in MA. Up to five awards ($65K each) will be granted. Application deadline March 28, 2018. More info...

Tufts Water Symposium: Water in Humanitarian Emergencies

In light of the rising frequency and intensity of natural disasters, Tufts' 9th annual Water: Systems, Science, and Society symposium will focus on water themes in disaster response. This conference is open to students, professionals, and others interested in this growing issue. More info and RSVP...

Water and Food Emerging Start-Ups: Get Ready for Cleantech Open

Entrepreneurs and researchers interested in launching clean technology start-ups should mark their calendars for Cleantech Open Northeast, the oldest and largest cleantech startup accelerator program, with the mission to find, fund, and foster entrepreneurs with ideas to solve environmental and energy challenges, including the areas of agriculture, water, and waste. Deadline: April 10, 2018. More info...

Are you interested in supporting J-WAFS?

Financial support from foundations, companies, alumni, and friends provides valuable resources to develop, sustain, and enhance the impact of J-WAFS activities. When you make a gift, you are making an investment in both the future of J-WAFS and our Institute-wide work to improve the productivity, accessibility, and sustainability of the world’s water and food systems.

For more information about sponsorship opportunities contact

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