

MSU Global Water Initiative  
Ecosystems, Human Health, Food and Food Security  
Final Version: April 27, 2011

*The Case for Action*

Water is fast emerging as one of the 21<sup>st</sup> century's key grand challenges, both in Michigan and globally. Almost literally surrounded by lakes, our state enjoys both the benefits of abundant fresh water as well as the complexities of managing this resource as part of the boundary-spanning Great Lakes ecosystem.

At a broader level, the world's leaders are now beginning to view water not just as an abundant and free resource, but as a limiting factor for human health, food production, and quality of life. Federal and international agencies as diverse as the World Bank, the National Academy of Sciences, the Bill and Melinda Gates Foundation, the National Academy of Engineering, and the Food and Agricultural Organization of the United Nations are calling for serious and immediate attention to water resources, both from the vantage of research and policy.

In short, the world can no longer take water for granted, and we know why: the imperative to provide the world's growing population with access to water as a basic human right, the deepening reliance of our global food production systems on water as an input, and the need to preserve and enhance water as a component of the environment. These issues are not unrelated to one another. Rather they represent multiple facets of a complex water system that in turn requires a systems approach if society is to successfully preserve and manage water as a resource.

As the recently commissioned Blue Ribbon Committee Report documents, MSU has many assets to address just these issues. Our global reach is broad, and it encompasses many of the earth's most water-challenged regions. Several of our faculty leaders are already recognized internationally in water science, and our disciplinary strengths are unusually broad. Much of MSU's longstanding, cross-cutting faculty expertise in water science and policy spans four colleges—CANR, CNS, ENG, and SSC. But there is serious expertise, too, in CVM (infectious diseases), Law (environmental law), and CAS (the Great Lakes Echo and the Knight Center for Environmental Journalism).

We have also appraised the external environment, in the process learning that institutions seeking leadership in addressing water as a grand challenge must have one more asset: They must get beyond the mindset of simply offering up a palette of narrow disciplinary experts as solutions providers. Today's world is asking research institutions to form and nurture transdisciplinary teams of researchers—scientists, engineers, economists, and those interested in public policy—all focused on a single problem. And MSU must respond.

MSU is well positioned to make this transition in water science and policy. We have created and sustained on-campus linkages through the Center for Water Science, the Institute for Water Research, MSU AgBioResearch, and ESPP—and forged productive collaborations with the University of Michigan, the Milwaukee Water Council, the Great Lakes Fisheries Commission, and other outside partners. In the process, we have brought together scientists who identify themselves closely with the subject of water science with others who incorporate water into their research programs, yet would be

better known as experts in climate, renewable energy, food, or health. Others, who are more peripheral and just beginning to understand the potential of water as an organizing theme, are beginning to engage.

As a result of these efforts, MSU's portfolio of external grants in water has grown over the past 5 years to be more than \$86 million. With the increasing interest on the part of external funders, there are cogent reasons to believe that this portfolio can grow through programs such as NIH's global health initiatives, NSF's Environmental Synthesis Centers, Water SMART, and Engineering Research Centers; EPA's Great Lakes Restoration Initiative, STAR program, and water protection programs; NOAA's coastline land conservation program; modeling programs in the Army Corps of Engineers; and USAID and foundation programs in global food security.

### *Three Strategic Water Themes*

MSU is poised to be at the forefront in addressing crucial issues of water science and policy just as Michigan and the rest of the world are recognizing that these issues warrant top priority. Needed now is bold targeted investment to broaden faculty leadership, expand our expertise, and institutionalize a systems-oriented, transdisciplinary approach.

We propose that MSU's strategic investment in water science and policy take the form of eight faculty positions, four to be made available in 2011-2012 and four in 2012-2013. Positions would be released with the requirement that academic units match them one to one, as well as identify space and startup. It would be understood, too, that one or more of the positions could be filled at a senior level to solidify leadership for this initiative.

These investments aim squarely at three water themes. These grand challenges have already been identified as college priorities, and importantly, they represent areas of emerging campus research excellence:

1. Water and ecosystems, including the impact of changing climate
2. Water and human health, including challenges posed by urbanization
3. Water in food and food security, both in the developed and developing world

### *Metrics of Success*

We suggest that campus investments be evaluated against a portfolio of measures that assess quality, impact, and institutional status as follows:

- The degree to which we can increase external funding above the mean rate of increase for the campus.
- The number of large, interdisciplinary research centers and institutes that are competitively funded at MSU or with MSU as lead of a consortium.
- The quantity and quality of the scholarly publications resulting from external funding.
- The extent to which we can document that our research discoveries are impacting policy and that policymakers are seeking our advice.
- The number of times that we are recognized by the media as leaders in water science and policy

- Our success incorporating water science and policy into educational programs for undergraduates and graduate students

*Strategic Planning in Water Science and Policy at the College Level*

A number of MSU colleges view water as having an important role in their research, outreach, and educational strategies, and four of them have assigned water science and/or policy a central role in their overall research priorities. These priorities overlap significantly and naturally in support of the proposed water themes as mapped out below:

Research Theme	CANR priority	ENG priority	CNS priority	SSC priority
<b>Water and ecosystems</b>	Very high	Very high	Very high	Very high
<b>Water and human health</b>	High	Very high	Very high	High
<b>Water and food security</b>	Very high	High	High	Very high

College of Agriculture and Natural Resources. CANR envisions water as a key component of all three of its major strategic research platforms—food and agricultural systems, natural resource and ecological systems, and bioenergy systems. These platforms align with the proposed campus water themes in scope and in reliance on a systems-based framework. The college has particular interests in freshwater ecology, water as a factor in bioenergy and food production, and the impacts of climate change on water. Priorities for hiring in CANR include consumptive water use in production agriculture, water quality and risk assessment, hydrology, aquascapes, and socioeconomic modeling of water uses.

College of Engineering. ENG views water-related research as one of three key pillars of capability enhancement in the college. Two particular areas of interest are urban water safety and accessibility (especially infrastructure and securing safe water supplies) and water quality assurance (especially ensuring that water for humans and animals is not imperiled by bacteria, viruses, and toxic agents). Priorities for hiring in ENG include risk and reliability engineering, water infrastructure engineering, public health engineering, urban hydrology enhanced laboratory and deployable sensors, water remediation, and purification technologies.

College of Natural Science. CNS has significant interest in two related lines of water research. One is water and health, where the focus is on microbial water-borne diseases. Robust linkages to the ERIN group (zoonotic diseases) and CAMRA (viral diseases) are envisioned. The college also has strengths in modeling of rivers, lakes, and underground aquifers as complex interconnected systems. The modeling approach to groundwater is particularly important, given the difficulty with which it can be observed and measured directly. The goal is to add faculty capacity in predicting how climate, land use, and environmental contamination will affect water supply and quality. Ultimately, both lines of research will guide policy decisions on monitoring and remediation.

College of Social Science. With one of the strongest communities of environmental social scientists in the nation, SSC is ideally positioned to address the social and economic problems that inevitably come

into play when water is the issue. This includes the nexus of science and policy as it relates to complex issues of remediation and adaptation to climate change. As a priority, the college proposes to add faculty capacity in water resources as a component of its already strong global change modeling program. Other hiring priorities include the relationship between water and the well-being of global ecosystems, as well as the generation of sound policies to guide water control, distribution, and use.

*Strategic Alignment to Ensure that the Whole Exceeds the Sum of its Parts*

Appropriate distribution of new positions among colleges is necessary but not sufficient to achieve MSU's water vision. To this must be added passionate leadership and agile, flexible alignment across disciplinary perspectives. Creation of a high profile MSU Water Initiative in the OVPRGS, with formal leadership entrusted to a director or pair of co-directors, would provide an ideal means to achieve this vision.

The director(s) must be credentialed as investigators, trusted by faculty and administrators alike, willing to assume accountability, and eager to adopt a strategic, systems approach to water issues. Respect for different perspectives and viewpoints, a commitment to transparency and communication, and a firm desire to spark teams of investigators in seeking external support are necessary as well.

Assignment of the alignment role to OVPRGS would provide a means to ensure coordination among academic units as positions are finalized and filled—and as teams are nurtured. Day-to-day management responsibilities need not be assumed by this office but could be delegated to an experienced entity such as ESPP, with the understanding that both a faculty advisory committee and a high level external science committee will be put into place. By leveraging AgBioResearch's current Water Imperative investments in ESPP, as well as ongoing ESPP programs in climate change and bioenergy, this approach would free the director(s) to focus on core science and policy issues.

Several overarching goals must be achieved by any alignment model. We must, for example, take advantage of the opportunity to attract current faculty expertise that may not yet be strongly identified with water. This is especially true at the interface with global climate change and energy—a major developing nexus in the eyes of the colleges and external funders. We need to integrate STEM approaches with those of social scientists and economists, creating research capacity that can address water from a broad systems perspective. And too, the global framework of the water initiative must remain explicit and match the aspirations of MSU as an institution.

In short, by organizing our water investments around these themes and empowering appropriate faculty leadership, we can provide solutions to discipline spanning, real world problems, even as we draw upon the strengths and vision as articulated by our colleges and departments—and deliver external resources and status back to MSU as an institution.