Water, Energy, Arid Environment Workshop Summary

The Water, Energy, Arid Environment (WEA) Strategic Planning Workshop was held September 15th and 16th at UA's Biosphere2. Nearly 60 participants gathered for the session from colleges across campus. Participants were identified for their expertise and diversity across the workshop topic areas and included participants from the physical sciences to the social sciences. The WEA reception included welcome remarks by Dr. Neal R. Armstrong and a reading by Chris Cokinos, Associate Professor, UA Department of English and Institute of the Environment, from his upcoming book "Re-Civilization: Six Heresies to Keep a Planet Running". Breakout discussions consisted of the following topics:

1) Water for Food, Energy, and Resilient Natural Systems,
2) Integrated Technological Solutions for Energy, Water, & Food,
3) Scaling: Molecules to Ecosystems and Earth Microbiome,
4) Opportunities in Environmental Systems and Population Health Research.

Each breakout session was held twice, and was moderated by experts in the field. Session leads reported back to the full group on the opportunities for growth, new strategic capabilities, proposed project time horizons, resources required, program risks, and strategic issues, focusing on what UA could and should do to ensure success.

The following represent the primary recommendations identified during the full-group discussion:

1. Develop/expand new initiatives that build upon UA's existing expertise in basic science, technology development, new understandings of policy development and assessment of societal impacts, which enable**:**
    - **i) control and optimization of the energy/water/food nexus;**
    - **ii) creation of sustainable water and groundwater systems in the face of enhanced climate variability;**
    - **iii) new routes to water purification and reuse;**
    - **iv) understanding the earth microbiome (at multiple scales),**
    - **v) ecosystem preservation, enhanced communities and connectivities, and new transportation systems.**

    Suggestions for specific actions included:
    a. Creation of entities that enhance the UA research portfolio in WEA areas (e.g. an energy institute). These new entities must complement existing centers (e.g. IE, WRRC, WEST, etc.), enhancing UA WEA research strength. There are clear advantages if these new activities integrate with:
        i) Recent Food, Energy, Water nexus initiatives at NSF (and arising DOE initiatives);
        ii) Recommendations arising out of the NSF-sponsored Energy/Water/Food Nexus workshop report from the April, 2015, UA-sponsored meeting at Biosphere 2.
    b. Development of focus groups and close collaboration with RDS in preparation for large proposal development and nimble response to new funding initiatives.
2. **Provide investment in critical research infrastructure.** Participants identified the need for additional infrastructure (physical and personnel) on campus, including:
    a. Facilitate the development of test-beds for research, development, and demonstration projects that allow UA researchers to uniquely address both basic and translational research at the Energy/Water/Food nexus. Support and maintain existing core instrumentation facilities essential to these efforts.
    b. Assess the possibilities/challenges for new initiatives in aerosol and dust research, green building design and controlled environment and precision agriculture practices.

c. Create a virtual network for collaboration and sharing of best practices. Increase virtual communications capabilities to reach rural communities.
d. Provide an easy-to-use, central infrastructure for geospatial data sets.
e. Further integrate the social sciences into WEA activities by developing a Southwest-based Energy Policy Think Tank. This could be expanded into an energy, food, water-centered policy resource.
f. Provide additional centralized resources and information on successfully completing the broader impacts section of proposals, including additional expertise in the College of Education.

3. **Nurture, maintain, and add to UA's research infrastructure.** Participants identified many of UA's unique resources, both physical and personnel, and recognized that resources require nurturing, maintenance, and eventually, additions. Specific suggestions included:
    a. **Leverage UA's unique testing facilities for multiple research projects.** Participants recognized the unique research facility available at Biosphere 2 and suggested promoting the facility for opportunities across campus, from space research to microbial research. In addition, participants recognized the new WEST center collaboration between UA and Pima County for water and wastewater research opportunities.
    b. **Provide a centralized resource for information on existing infrastructure**. It was suggested that ORD could provide a centralized source of information on UA's existing core facilities, including capabilities, training and access information.
    c. **Increase promotion of UA's expertise with collaborators, funders, and the media locally, nationally, and globally.** Participants sought assistance in outreach, from promoting the application and usability of their sciences to connecting with news media locally and nationally. It was acknowledged that elevating the UA's research profile in the media and with the public could enhance the research image of UA with funders. Further acknowledging and promoting UA's border location and arid environment was also viewed positively as well as expanded into global research (particularly on the arid environment). It was noted that graduate students could assist in outreach through Graduate Outreach Assistantships.
4. **Enhance support for interdisciplinary research groups on campus.** Session participants sincerely valued gathering as an interdisciplinary group. Participants recognized that many researchers on campus do not interact with faculty outside of their core department and that many of the interdisciplinary programs were more student focused, placing the interdisciplinary onus on the student rather than the faculty.
    a. Facilitate mechanisms for interdisciplinary faculty to meet and share ideas; suggestions included interdisciplinary workshops, interdisciplinary standing committees, and online networking tools.
    b. Facilitate mechanisms for enhanced collaboration between the colleges and departments across campus, particularly connecting enhancing connections a) between the physical and environmental sciences and engineering departments; b) these connected units with the health sciences.

In immediate response to suggestion 4, groups based upon the breakout discussions will continue meeting through the 2015/2016 academic year to further define initiatives, craft reports and prepare internal proposals, and lay the groundwork for externally-funded projects. Once such group has already met, the Conservation, Communities and Connectivities Group. For information on the breakout session groups, including how to participate in follow-on meetings, please contact the group lead:

- Water for Food, Energy, and Resilient Natural Systems, Sharon Megdal, Director of the Water Resources Research Center, smegdal@email.arizona.edu, Greg Barron-Gafford, Assistant Professor of Biogeography and Ecosystem Science, gregbg@email.arizona.edu
- Integrated Technological Solutions for Energy, Water, & Food, Kim Ogden, Professor of Chemical & Environmental Engineering, ogden@email.arizona.edu, and Ardeth Barnhart, Program Director of the Renewable Energy Network, ardethb@email.arizona.edu
- Impact of Earth's Microbiome on Global System Functions & Dynamics, Raina Maier, Professor of Soil, Water, and Environmental Science, rmaier@ag.arizona.edu, Peter Reiners, Professor and Department Head of Geosciences, reiners@email.arizona.edu, Jon Chorover, Professor and Department Head of Soil, Water, and Environmental Sciences, chorover@email.arizona.edu
- Environmental Systems and Population Health, Shane Snyder, Professor of Chemical & Environmental Engineering, snyders2@email.arizona.edu, Jeff Burgess, Associate Dean for Research College of Public Health, jburgess@email.arizona.edu
- Conservation, Communities and Connectivities, Dave Breshears, Professor School of Natural Resources and the Environment, daveb@email.arizona.edu

For additional information on the workshops, please contact Jennifer Barton at barton@email.arizona.edu or Neal Armstrong at nra@email.arizona.edu.