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The Intelligent Use of Water™ Summit IX A Look at Global Conservation Initiatives and Strategies: Sustainability in the Southwest

Wednesday, September 3, 2008 — 8:30 a.m. to 11:00 a.m. • Global Institute of Sustainability • Arizona State University — Tempe, AZ

SUMMIT IX PANELISTS' PAPERS

Doug Bennett

Water Conservation Manager,
Southern Nevada Water Authority

Patricia Gober

Professor, School of Sustainability and School of Geographical Sciences,
Arizona State University

Richard Little

Director, The Keston Institute for Public Finance and Infrastructure Policy,
University of Southern California

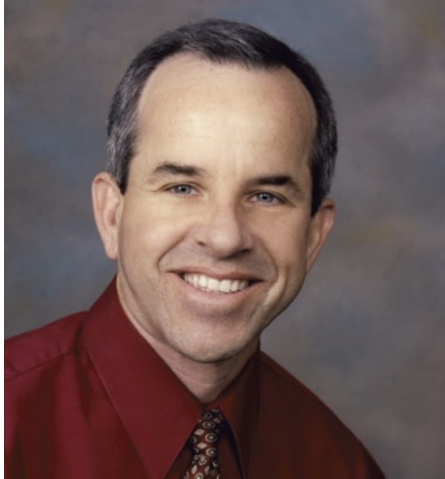
Charles Redman

Director, School of Sustainability,
Arizona State University

MODERATOR

John D'Anna

Senior Editor, *The Arizona Republic*



DOUG BENNETT

Doug Bennett literally began his career “in the trenches” in 1980 as a landscape maintenance and irrigation technician. Armed with a bachelor’s degree in agriculture and a master’s degree in business, he served eight years as an assistant professor for New Mexico State University, promoting xeriscaping and efficient landscape irrigation techniques. In 1995, Bennett joined the City of Albuquerque where he developed and managed a variety of water-efficiency programs, including landscape conversion rebates, water waste enforcement, residential retrofit audits, appliance and fixture rebates and green industry education. Since 2000, Bennett has been conservation manager for the Southern Nevada Water Authority, managing the nation’s largest conservation incentive programs and coordinating regional water-efficiency efforts for the Las Vegas, Nevada area.

CAN WATER EFFICIENT TECHNOLOGY SAVE US FROM OURSELVES?

Technology has brought us more than 60-inch televisions, it’s also produced some remarkable innovations in water efficiency. Today’s plumbing fixtures and home appliances are more efficient and effective than ever before. The newest toilets flush effectively with 60 percent less water than their 1980’s counterparts. High efficiency washing machines use less than half the water of traditional toploaders. Irrigation controllers and sensing technology can predict when our plants need water, while drip irrigation and high-performing sprinkler nozzles allow us to place that water more accurately than ever before.

With all that technology, today’s homes ought to use a fraction of the water of an older home, right?

Not necessarily, according to preliminary results from a nationwide, EPA-funded study that’s looking at water use characteristics of new homes. One component of the nine-city study compared water consumption of 9,000 homes built prior to 2001 and 9,000 built after 2001. In seven of the nine cities, new homes were found to be using more

water than their older counterparts – as much as 40 percent more.

How can that be?

While indoor water technology may have taken two strides forward, the study indicates we may be walking on a treadmill. For example, although federal law limits a showerhead to 2.5 gallons per minute, there is technically no limit on how many nozzles may be plumbed into single stall. In more and more homes, the shower is no longer a simple hygiene appliance. Instead, it is a spa-like escape, with fixtures that may command more than 10 gallons per minute. In addition to the flow, new amenities encourage lingering as users call up their favorite music or even work on their skin tone under integrated tanning lamps.

While most Americans are still mostly business under their single showerhead, we typically have more bathrooms than our parents did. In the 1950’s a single bathroom was the norm. By the 1960’s two bathrooms became the norm for middle America. Today, three to five bathrooms are common in new homes. Granted, more bathrooms doesn’t translate to more flushes, but it does assure more water use, since about 20

percent of toilets have a leaking flapper. Other modern conveniences, such as water filtration systems and softeners, serve to further consume water conserved elsewhere in the home.

As quickly as efficiency innovation can establish itself, consumptive designs and behaviors may push it back. As a result, the data indicates winter water demand of new and old homes is nearly identical. The good news is that higher occupancy of the new homes equates to a 12 percent reduction on a per person basis.

Occupants, however, have little bearing on outdoor water use. The study found a strong upward trend in seasonal water use, with newer homes averaging 13 percent more water during the growing season than the older homes, despite a 6 percent average reduction in lot sizes. While additional inquiry is needed, preliminary data suggest that higher rates of landscape irrigation are responsible for the trend.

Surprisingly, the largest increases in growing season water use were seen in cities with high precipitation: Eugene, Oregon and Jacksonville, Florida. These two cities saw increases in growing season demand of 62 and 70 percent,

respectively. In both cases, growth in use coincides with increased prevalence of automated irrigation systems. Only two of the nine cities showed reductions in seasonal water use: Phoenix and Las Vegas. In these two cities, almost every new home has an automated irrigation system.

Water isn't the only resource affected by higher demand. Peak summer water use is the principal driver behind infrastructure sizing. Water utilities must construct and operate facilities that meet and exceed the peak summer demand; the one single day when the community demands more water than any other. In essence, the system is overbuilt for the other 364 days of the year. The treatment and movement of water is one of the most power intensive operations in any municipality. In the Las Vegas region, water agencies use more than 1,000 kwh per year to meet the water needs of a single home. Despite the agencies' efforts to

accelerate use of green power, each home's water use broadens their carbon footprint by almost one-half metric ton annually. That's water production and delivery only and doesn't include any water-related energy used within the home or to treat the wastewater produced by each home.

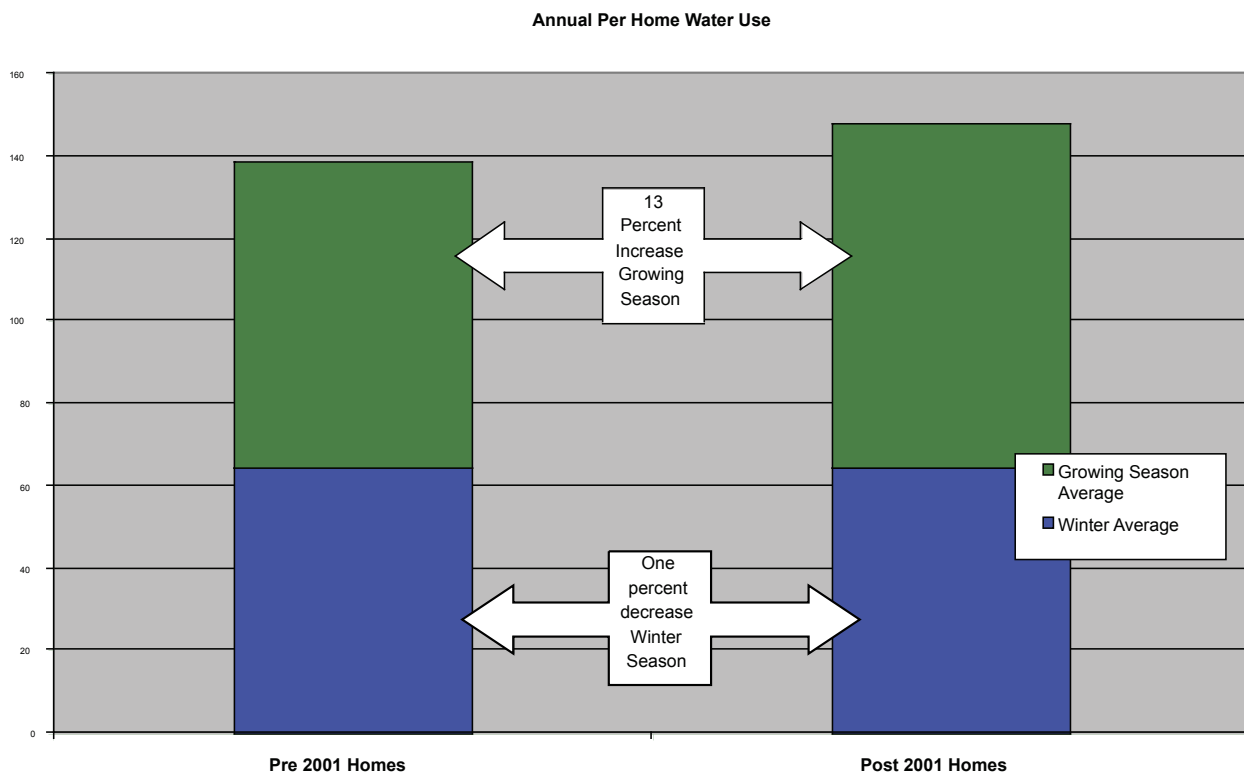
We may be doing the right things, but are we doing them the right way? We can't blame automated landscape irrigation for increased use anymore than we could blame an automaker for a speeding ticket. It is the combination of how we design and manage our landscapes that ultimately decides outdoor water use. It is clear, however, that we need to do it well, do it swiftly, and do it collaboratively.

Water agencies cannot do the job alone, though some still try. While regulatory approaches can be highly effective, even those are most successfully implemented with the support of stakeholders. The

landscape industry is one of the most critical water efficiency partners in any community. For the private sector, water efficiency must be profitable. For the end user, it must sustain or improve quality of life. Anything less will have very low appeal at a time when widespread adoption is critical.

In the Las Vegas region, government and industry are pursuing efficiency through partnership. The Southern Nevada Water Authority's (SNWA) Water Smart Home program, the nation's largest program for water efficiency in new homes, assures use of efficient fixtures, appliances, landscape design and irrigation techniques. More than 7,000 homes have been built to the voluntary specifications.

A common misconception is that the interests of the landscape industry and water conservation are at odds. The SNWA has injected over \$100 million in incentive



From a sample of 18,000 homes in nine U.S. cities. Preliminary research results courtesy of Aquacraft Inc. Water Management and Engineering.

money into the landscape industry since 2000 and has budgeted over \$45 million for the current year. More than 30,000 properties have participated in a program to retrofit existing high water use landscapes to water efficient landscaping. These incentives have stimulated over \$300 million in new business for the landscape, irrigation and nursery industries in the region. Funding for the programs comes primarily from new connection fees, thus new customers pay for programs that help make their water available.

SNWA's Water Smart Contractor program provides training and marketing for about 80 participating landscape companies.

These companies are featured on the agency website and are allowed to use the program logo in their advertising. In return, they agree to abide by water efficiency principles on all projects.

These programs have been valuable tactics in a multi-faceted effort that has reduced southern Nevada's per capita water use by 20 percent in the last five years without compromising quality of life. Still, these are but a few steps on a much longer path.

In virtually every city, growing water demand will eventually challenge the infrastructure, the limits of the water resource, or both.

Communities with seemingly ample supply

may find themselves in crisis as a result of drought or a court decision. It is not so much "if" as "when."

We cannot continue on a course when we already know the path will be blocked ahead. Working together, government and industry have the ability to navigate a more sustainable course that appeals to the consumer.

Whenever I ponder the course we're taking, I ask myself whether future generations will cheer, or jeer, the decisions we've made. As it stands today, I'm envisioning a smattering of polite applause. We can do much better.



PATRICIA GOBER

Patricia Gober received a PhD in Geography from the Ohio State University in 1975 and is currently a professor of geography at Arizona State University where she served as departmental chair from 1984 to 1991. She is co-director of the National Science Foundation's Decision Center for a Desert City which studies water management decisions in Greater Phoenix. She is a past president of the Association of American Geographers, former member of the Population Reference Bureau's Board of Trustees and the Science Advisory Board of NOAA, and former chair of the College Board's Advanced Placement Human Geography Committee. She also served on the National Research Council's Committee on Geographical Sciences. Her most recent book, Metropolitan Phoenix: Place Making and Community Building in the Desert, was published in 2006. She holds an honorary doctorate of science from Carthage College in Kenosha, Wisconsin. Gober serves on the Arizona Schools Facilities Board and edited the 91st Arizona Town Hall volume, Land Use: Challenges and Choices for the 21st Century.

THE INCONVENIENT TRUTH ABOUT PHOENIX

There has been a dramatic increase in the number of Americans who identify climate change as a serious environmental threat, but an unfortunate tendency to see it largely as a problem for people around the world. When asked to indicate the scale at which climate change impacts

are of greatest concern to them, few Americans worry about the immediate impacts on themselves, their families, and their communities. This tendency to externalize climate change to other people and other places is particularly problematic in a place like Phoenix where we do not see the direct effects of climate change, as for example, in sea level rise, thawing permafrost, melting

glaciers or early spring greening. Nonetheless, recent climate models offer some sobering forecasts of warmer and drier conditions in the watersheds that provide Phoenix's water supply. The inconvenient truth is that we are at ground zero for climate change, both in terms of our physical exposure to climate impacts but also in the inability of our water institutions to adapt to these impacts.

Physical exposure stems from our large hydraulic reach. The Phoenix area depends upon water from faraway watersheds to supply our cities, factories and farms (Figure 1). Our sustainable surface supplies originate in Salt and Verde Watersheds of the Rim Country and in the Colorado River Basin stretching from Wyoming, across vast swatches of Colorado and Utah to include all of Arizona and parts of New Mexico, California and Nevada. We depend upon snowpack in the mountains of Central Arizona and in Wyoming and Colorado to provide enough water, now and into the future. A substantial body of climate research now points to warmer and drier conditions on these watersheds, with inevitable reductions in runoff and future water supplies. There is, however, considerable uncertainty in the models about the amount and timing of these reductions. One prudent way to address this uncertainty is to manage the risk of climate change as we would manage risk in our investment portfolios, in our decisions to purchase life and health insurance and in our approach to pursuing one medical therapy over another. In the case of climate change, risk management boils down to figuring out what outcomes we are unwilling to accept, and taking actions to reduce the chance they will occur.

Much of the debate about climate change has centered on mitigation—how do we reduce greenhouse gas emissions and restore the atmosphere to pre-1990 or pre-2000 CO₂ levels. While this is a useful and important debate, it does not address the fact that we have set into motion a large number of physical changes in Earth's atmosphere and oceans that cannot be undone in the next 20 or 30 years. We will need to adapt to these changes in the short run until they can be undone in the long run. While mitigation is a global issue with global consequences,

most adaptation to climate change will occur at local and regional levels where decisions, in Phoenix's case about water, are actually made.

While each of us has an individual responsibility to use water more carefully, water in Arizona is managed by human institutions that generally are not proactive about climate change. The Phoenix area has, in fact, enjoyed a plentiful supply of water that has facilitated growth and the creation of a heavily-watered urban landscape with backyard pools, urban lakes, irrigated grasses, trees and shrubs and outdoor fountains. Depending upon the municipality, between 60 and 75% of our residential water use is for outdoor purposes. Our water institutions have facilitated this form of land development with cheap water and assurances that we can find more when we need it by purchasing agricultural water rights, cloud seeding, desalination and larger storage capacity.

Although these institutions have managed the region's water supply extremely well until now, they are too rigid, fragmented and focused on scientific understandings of past climate conditions to adapt easily to the threats and challenges of climate change. Water rights are assigned based on who used it first 100 years ago. Decisions are made, not at a regional level, but by 56 water providers, each with a different portfolio, rate structure and conservation plan. With a few notable exceptions (East Valley Water Forum), there is little regional coordination. Emphasis is on supply-side fixes such as purchasing water rights from farmers, cloud seeding, desalination, and increasing storage capacity rather than demand management of our heavily watered, climate-sensitive urban landscape. Leadership and coordination of our water institutions is essential to mounting a regional response to the risks of climate change.

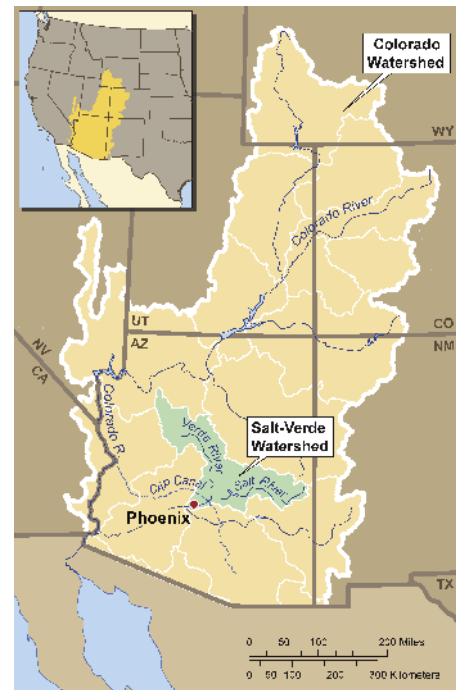


Figure 1

It is foolhardy for the residents of Phoenix to see climate change as a problem for Africans, Pacific Islanders and residents of Polar areas. Because our water supply comes from faraway regions, we are extraordinarily exposed to the physical impacts of global warming. We have built human institutions to manage one of the most sophisticated water storage and delivery systems on the planet, but these institutions were built to manage 20th Century, not 21st Century, climate conditions. While we cannot know for sure how seriously we will be affected by climate change, we can take actions now to reduce our risks by integrating climate forecasts into the water planning process, by reducing the demand for outdoor water and through coordinated regional leadership and action.



RICHARD LITTLE

Richard G. Little is director of the Keston Institute for Public Finance and Infrastructure Policy at the University of Southern California where he teaches, conducts research and develops policy studies aimed at the discussion of infrastructure issues. In this role he interacts extensively with California's political, financial and business leaders. Prior to joining USC, he was director of the Board on Infrastructure and the Constructed Environment of the National Research Council (NRC). He has conducted numerous studies on life-cycle management, financing of infrastructure and hazard preparedness, and mitigation and has published extensively on risk management and decision-making for critical infrastructure. Mr. Little is certified by the American Institute of Certified Planners and was elected to the National Academy of Construction in 2008. He is a member of the American Planning Association and the Society for Risk Analysis and Editor of Public Works Management & Policy. He holds a B.S. in Geology and an M.S. in Urban-Environmental Studies, both from Rensselaer Polytechnic Institute.

THE NEED FOR MARKET DISCIPLINE IN WATER PRICING

Despite arguments that water is too necessary to life to be priced or treated as anything other than a public good, "free" water comes with its own costs. For far too long, the U.S. has treated water as though the supply was endless and the cost of provision an afterthought. Although below-market pricing gives consumers a benefit in the short-term, hidden subsidies come with hidden costs. First, maintenance and repair of the infrastructure is often

deferred or not done at all. Second, without pricing signals, people have little incentive to practice the most basic conservation and usually don't.

This is not just a U.S. phenomenon. For example, in Dar es Salaam, Tanzania, water was historically subsidized and provided below cost. In addition to the negative impacts of such policies on water usage and capital investment in the system, these practices actually hurt the very people they were intended to help. By reducing revenues to a level below which

can be raised regarding what constitutes equitable charges for the basic building blocks of civil society and, in the case of water, a necessity of life itself, these questions do not obviate the fundamental reality that projects and services must be paid for; if not directly by some or all of the users, then by the larger "public" in their stead. There is no way to finesse this issue over the long term. Civil infrastructure and services must be supported by revenue streams generated either by taxes or fees that are paid to a service provider whether public or private. Unless governments (and their voters) choose to treat water as a public good and provide it through general tax revenues, water systems are subject to the same laws of economics as every other business and customers cannot be shielded indefinitely from this reality. Charging less than it costs to deliver a safe, reliable water supply is neither good business nor good public policy.

system expansion and improvement cannot occur, the availability to poor people of even marginally purified water is also reduced, leaving them the undesirable options of using more expensive or unsanitary sources. This downward decline in service in the absence of adequate revenues is depicted in Figure 1.

Although there are definitely social and moral questions that

For many reasons, the public sector has traditionally been unable or unwilling to sustain a market approach to the provision of water. There was a push to privatize water systems in the 1990s, primarily driven by the poor performance that goes hand-in-hand with below-cost, politically-driven

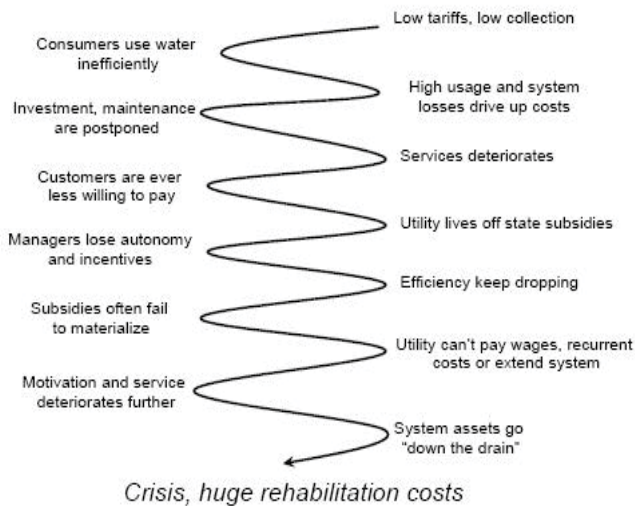


Figure 1. Service quality spiral downward when service is provided below cost.

rate structures. However, as the reality of the market has begun to take effect, there are efforts afoot for the public sector to take back control of these systems. Those opposed to private involvement in the delivery of “public” services see price gouging as the inevitable outcome of these arrangements. A legitimate question to ask is whether the public interest is well-served by a system where prices are kept artificially

so low as to preclude the delivery of safe, reliable services and where sufficient revenue cannot be generated to support routine maintenance, repair, and renovation.

We’ve seen that when the price of gasoline passes a certain threshold, people will actually drive less. When we ask people to be public-spirited and conserve water

during a declared drought emergency, they continue to hose down their sidewalks. In California, a debate rages in Sacramento about whether to spend billions of taxpayer dollars to build more dams so we can pretend we live in the tropics and not a desert. We know that people make rational choices based on their pocketbooks. For many reasons, it’s time that we gave them some real incentives to do so with water.



CHARLES REDMAN

*Charles Redman has been committed to interdisciplinary research since as an archaeology graduate student he worked closely in the field with botanists, zoologists, geologists, art historians, and ethnographers. Redman received his BA from Harvard University, and his MA and PhD in Anthropology from the University of Chicago. He taught at New York University and at SUNY-Binghamton before coming to Arizona State University in 1983. Since then, he has served as chair of the Department of Anthropology, director of the Center for Environmental Studies and, in 2004, was chosen to be the director of the newly formed Global Institute of Sustainability. In July 2007, Redman became the inaugural director of ASU’s School of Sustainability. He is the author or co-author of 14 books including *Explanation in Archaeology*, *The Rise of Civilization*, and *Human Impact on Ancient Environments* and, most recently, co-edited three books. Redman is currently working on building upon the extensive research portfolio of the Global Institute of Sustainability to develop the new School of Sustainability which is educating a new generation of leaders through collaborative learning, transdisciplinary approaches, and problem-oriented training to address the environmental, economic, and social challenges of the 21st Century.*

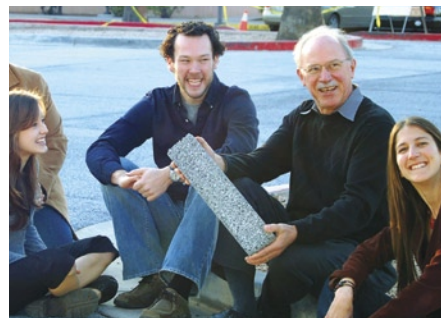
THE FIRST SO THE WORLD LASTS

Welcome to Arizona State University (ASU) and the nation’s first School of Sustainability where faculty and students alike are embarking upon one of the boldest, most comprehensive approaches to sustainability attempted at any university. We are engaged in a global-survival experiment, in a time when sustainable solutions must be envisioned and implemented.

What is Sustainability?

Sustainability is the “reframing” of the debate over the human-environment relationship critical to ensuring quality of life for future generations—whether

the human life-support system on earth can continue indefinitely, or whether it is changing the world in radical ways that will lead to collapse. The debate has evolved from past polarizing conversations of “either development or environment”



to discussions of how humankind can transform its economic growth system into a sustainable approach to living on a delicate planet. Sustainability seeks to provide the best outcomes for both human and natural environments both now and into the indefinite future. Sustainability is becoming an increasingly important area of research and education within the academic community as a reflection of trends in society, industry, and government.

Sustainability Frames our Research and Curriculum

The urgent global issues that impact our way of life require new, effective

institutional arrangements to harness science and technology and to envision and create adaptive solutions for a rapidly urbanizing world. The specific, interrelated challenges that frame the research and curriculum of the new School are:

- the challenges of rapid urbanization wrought by a doubling of global urban population in the next 30 years;
- the increased competition for water and other essential natural resources that are in relatively fixed supply;
- the need for renewable energy, “smart” materials, and effective knowledge systems
- the need to understand the human dimensions that influence sustainable programs and practices;
- the need for policy and governance that supports sustainable programs and behaviors;
- the need to conserve biodiversity and habitats; and
- challenges of providing for global growth and equity in standards of living without endangering the Earth’s natural systems.

ASU is Leading the Way in Sustainability

Our true potential as an institution is directly linked to realizing the potential of our society. The School of Sustainability is creating a new interdisciplinary model of education for the 21st century. Issues such as joint hires, transdisciplinary teaching, and community engagement will be central to the success of our School. We will be an incubator of innovative problem solving in sustainability through interconnections between research domains and curriculum.

The Global Institute of Sustainability is already successfully engaged in collaborative relationships with colleges and programs across the University and with institutions and corporations worldwide—with the aim of creating a community of experts to address complex environmental and social challenges. From this genesis, the Institute and School together are launching ASU’s university-wide sustainability initiative, creating a comprehensive transdisciplinary approach to creating knowledge and research in sustainability.

Arizona is a logical place to lead the nation in addressing the challenges of urban

sustainability. ASU, deeply embedded in the Phoenix metropolitan community, is creating knowledge and use-inspired research to address time-sensitive issues in rapidly urbanizing areas. These issues, crucial not only to Arizona but to the world, include: the effects of urban heat island, pollution, limited water and energy supplies, the need for sustainable material development, and urban planning. The Southwest holds a living laboratory to do use-inspired research and test approaches to urban sustainability.

Join us as the School of Sustainability positions ASU as a leader in sustainability education and a major force in the production of intellectual capital for sustainability research.



JOHN D'ANNA MODERATOR

John D'Anna, senior editor of the Arizona Republic, writes the azgreenday blog on azcentral.com, which discusses environmental sustainability issues as they relate to the state of Arizona. D'Anna received his B.A. degree in journalism from The University of Arizona. From 1997 to 2002, he oversaw newsroom legal issues for the Republic, including a successful mandamus action before 9th Circuit Court of Appeals involving the criminal trial of Governor Fife Symington and a successful public records access suit against state Education Department over the release of standardized test questions. Both efforts were honored with freedom of information awards from the Society of Professional Journalists and the Arizona Newspapers Association. He is an adjunct faculty member at the Walter Cronkite School of Journalism and Mass Communications, Arizona State University and serves on the board of the Arizona First Amendment Coalition. In 2003, Mr. D'Anna was recognized nationally as one of Gannett's top 16 newsroom supervisors.