

ARIZONA STATE UNIVERSITY TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)



Through interdisciplinary projects, Central Arizona-Phoenix Long-Term Ecological Research project scientists (top) examine the effects of urbanization on desert ecosystems.

The renovated building that houses ASU's Global Institute of Sustainability (middle) has become a global icon for sustainable design. Environmental Design + Construction magazine awarded the building its 2009 Excellence in Design Award in its educational category for the project's demonstration of excellence in green building and sustainable design.

Using state-of-the-art visualization, simulation, and collaboration tools, Decision Theater (bottom) is leading efforts to address global sustainability challenges and has become a powerful resource to aid decision-making efforts including mitigation of the spread of the A/H1N1 influenza strain known as the swine flu.



ARIZONA STATE UNIVERSITY

SUSTAINABILITY INITIATIVE

Arizona's quality of life, condition of the natural environment, and strength of the economy will increasingly depend on finding solutions to challenges of sustainability. These challenges include climate change, rapid urbanization, water quality and supply, biodiversity, social transformations, and energy supply and efficiency. ASU is committed to education, discovery, innovation, and outreach activities that will yield solutions to such challenges.

While the concept of sustainability was once associated exclusively with environmental advocacy, it has now become mainstream. Sustainability is rapidly becoming an academic discipline, a critical aspect of corporate competitiveness and profitability, and a platform for economic development policy. The Global Institute of Sustainability is ASU's primary vehicle for motivating, organizing, and assessing research in sustainability. Although the Institute itself is a relatively small unit, its mission is to work on a university-wide basis in support of teaching and research in sustainability science and to encourage ASU units to build bridges that connect scientists, policymakers, and business leaders on critical local and global challenges of sustainability.

Sustainability is a broad domain, including research investments in biodesign, engineering, public health, human evolution and social change, and life science. However, for purposes of focus and clarity, this document reports on past and proposed ASU TRIF investments in three areas that are involved in sustainability research:

- **Arizona Institute for Renewable Energy (AIRE)**, which oversees key investments intended to develop reliable, affordable, renewable energy sources and storage suitable for commercialization in the Southwest United States.
- **Decision Theater (DT)**, a policy informatics and visualization laboratory that studies how decisions for a more sustainable future are made, understood, and improved.
- **Global Institute of Sustainability (GIOS)**, which catalyzes and advances interdisciplinary research on environmental, economic, and social sustainability with a special focus on rapid urbanization.

SUMMARY REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 2009

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Dr. Robert Melnick
Executive Dean,
Global Institute of Sustainability



PERFORMANCE ANALYSIS

Sustainability	FY10	FY11
PERFORMANCE MEASURES/IMPACT	Proj	Proj
Return on Investment (\$ amounts in millions)		
Federal and non-federal awards	32.20	40.00
Royalty income	0.10	0.30
Foundation funding	1.50	2.50
Return Total	33.80	42.80
Work Force Contributions		
Post-doctoral appointments	29	35
Post-doctoral researchers leaving to enter the workforce	13	18
Graduate students employed	114	142
Graduate students earning degrees and entering the workforce	43	60
Undergraduate students involved	77	87
Partnerships/Collaborations		
The number of research grants/contracts involving funding from non-government entities	24	33
The number of research grants/contracts involving subcontracts to non-ASU researchers	21	27

DISCUSSION OF PERFORMANCE

Return on Investment The Sustainability Initiative is well poised to begin generating substantial research dollars from federal and non-federal awards. Investigators and affiliated faculty conducting Sustainability research are projected to hold more than \$32M dollars in sponsored awards in FY10 and approximately \$40M dollars in FY11. Sustainability proposal activity will continue to increase with the continued recruitment of senior faculty, the development of new programs, and new activity from junior faculty.

Economic Impact

The impacts of a successful investment in sustainability science research will include, but are not limited, to: the creation of well-paying “green jobs” in sustainability-related businesses; the development of an Arizona work force with the knowledge, analytic capability, and technical skills to power a “green economy;” the development of solutions to sustainability challenges such as water supply, rapid urbanization, land use, and biodiversity; an increase in public, philanthropic, and private funding of ASU research in renewable energy, decision making, and climate adaptation by 15 percent annually; and the development and transfer of new technologies to the private sector will expand.

Students Trained

Through the Sustainability Initiative the number of students prepared for the new “green economy” will grow. In FY10 there will be a projected 29 new post-doctoral appointments and an additional 13 post-doctoral researchers leaving ASU to enter the traditional work force. Also, approximately 114 graduate students and 77 undergraduate students will be involved in research through the initiative, and a projected 43 graduate students will earn their degrees and enter the work force. New interdisciplinary curricula in the School of Sustainability will offer degree options to educate the next-generation work force and prepare citizens for the renewable energy society.

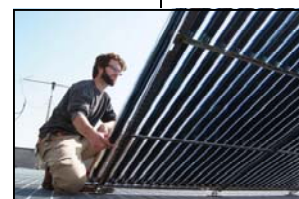
Partnerships/Collaborations

The number of partnerships and collaborations through the Sustainability Initiative is growing. This is reflected in the increasing number of research grants and contracts involving funding from non-governmental agencies and the number of subcontracts provided to non-ASU researchers. AIRE, DT, and GIOS all maintain many productive relationships with organizations from industry, government, and academia .

ECONOMIC OPPORTUNITIES

Conducting research and education on sustainability is a classic example of having the opportunity to “do good and do well” at the same time. Quite apart from the chance to help mitigate current, serious threats to local and global environmental quality, research and development in sustainability has become a significant opportunity for strengthening Arizona’s economy. The federal government, large philanthropies, and the private sector are increasing their funding commitment to technologies, processes, and policy making in sustainability. As an example, the very backbone of the American Recovery and Reinvestment Act of 2009 (aka the “stimulus package”) is comprised of investments in research that will both create “green jobs” and reduce U.S. dependence on limited and vulnerable foreign sources of energy. The funding available in FY10 from this Act alone exceeds \$75 billion. Thus, a TRIF investment in sustainability research at ASU will help the state capitalize on this economic opportunity and, at the same time, educate a generation of decision makers.

ASU’s principal TRIF investment in sustainability research is in renewable energy; that is, funding intended to attract talent and investment to the state from companies already in or intending to enter this lucrative market. This mission is consonant with a growing push by the Arizona economic development community to make the state the “solar capital of the world.” Indeed, Arizona clearly has the potential to achieve this goal due to its large amount of land suitable for concentrated solar power (19,300 square miles), substantial existing engineering and biodesign talent, and abundance of sunshine (the highest of all the states with a resource potential of 7.5 kWh/m² per day). Indeed, research and development in “light inspired” energy, both to improve the efficiency and delivery of traditional technologies in solar power and to develop new, biomimetic approaches, are of great interest to private and public investors. Since the commercial viability of such technologies is influenced by economic policies, ASU will also use TRIF funds to develop decision-making data, models, and techniques that will enable Arizona leaders to make sound, science-based policy choices to enhance our economic prospects and, at the same time, create a more sustainable state.



Through ASU's National Center for Excellence on SMART Innovations (top), students work on applications for business, technology, and policy innovations related to climate change and energy.

Phase one of ASU's solar installations (bottom) totaled 1.88MW and is the largest solar portfolio on a single U.S. university campus.

FINANCIALS

Sustainability	FY10	FY11
	Rev Budget	Rev Budget
REVENUE		
Carry Forward		
New TRIF Revenue	1,900,000	1,900,000
TOTAL REVENUE	\$1,900,000	\$1,900,000
OPERATING BUDGET		
Personal Services	775,200	775,200
Employee Related Expenses	182,400	182,400
Operating Expenses	562,400	562,400
Total Operating Budget	\$1,520,000	\$1,520,000
CAPITAL BUDGET		
Building Renovation	380,000	380,000
Debt Service		
Total Capital Budget	380,000	380,000
TOTAL EXPENDITURES	\$1,900,000	\$1,900,000
Return On Investment	17.8:1	22.5:1

GOALS AND RESULTS

With support from TRIF and other sources of investment, ASU has developed a robust research program in sustainability. The university also recently launched the nation's first School of Sustainability. ASU's work on sustainability research and education will continue to accelerate and will achieve the following goals in FY10 and beyond:

Goals

- Develop the next generation of high-efficiency, multijunction (MJ) solar cells
- Use nanostructures to boost the efficiency and lower the cost of thin-film solar cells
- Develop low-cost organic polymer and other organic and inorganic hybrid solar cells
- Establish an industrial laboratory for low-cost Si module design
- Offer new technology for the future "smart" electric grid
- Receive \$24M in FY10 grants/contracts for renewable energy research
- Receive \$1M in FY10 for research on sustainability decision making
- Receive \$7.5M in FY10 for sustainability research in diverse subjects
- Be awarded one large scale (\$5M-\$20M) sustainability science research project in water management, atmospheric, climate change, or rapid urbanization

Indicative Results through June 30, 2009:

- Ongoing, multi-year research awards currently include the Central Arizona-Phoenix Long-Term Ecological Research (\$5M/6 years/NSF), Decision Center for a Desert City (\$6.7M/5 years/NSF), Designer Organisms for Biohydrogen Production (\$10M/private donor), Conservation in a Social Context (\$2M/5years/MacArthur Foundation)
- Awarded \$14.6M in 2009 from the U.S. Department of Energy to establish an Energy Frontier Research Center on Artificial Photosynthesis
- Awarded \$2.44M in 2008 for two Solar America Initiative programs (U.S. DOE)
- TUV Rheinland invested \$5M in 2009 to start a new business (40,000 square-foot facility, 40 jobs created) in Tempe based on an ASU-developed solar energy assessment technology
- Algae-to-fuel research by ASU scientists was named the number 11 top invention of 2008 by Time, Inc and became a multi-million dollar spinout company: Heliae Development, LLC.
- The Decision Theater provided decision science workshops on climate change for the National Oceanic and Atmospheric Administration, American Meteorological Society, and the Arizona Water Institute and led exercises with government agencies regarding pandemic flu
- National recognition of ASU faculty research in sustainability science included the American Association for the Advancement of Science (Gober, Grimm), Leopold Leadership Fellowship (Wu), Carnegie Foundation for the Advancement of Teaching (Allenby), Ecological Society of America's (Fisher), Geochemical Society, and European Association for Geochemistry (Shock)

MANAGEMENT

OFFICE OF THE VICE PRESIDENT FOR RESEARCH AND ECONOMIC AFFAIRS

R.F. "Rick" Shangraw: Vice President for Research and Economic Affairs

Sethuraman Panchanathan: Deputy Vice President for Research

GLOBAL INSTITUTE OF SUSTAINABILITY

Rob Melnick: Executive Dean

ADVISORY BOARD FOR SUSTAINABILITY AT ASU

- **Ray Anderson** — CEO, Interface Global
- **Tim Albinson** — CEO, Aravo Solutions, Inc.
- **David Butterfield** — President, Trust for Sustainable Development
- **Brad Casper** — President and CEO, Dial-Henkel
- **William Clark** — Harvey Brooks Professor, Harvard University
- **Sue Clark-Johnson** — Former President, Newspaper Division, Gannett Company, Inc.
- **Michael Crow** — President, ASU
- **Robert Kates** — Professor Emeritus, Brown U.
- **Julia Marton-Lefevre** — Director General, World Conservation Union
- **Pam Matson** — Dean, School of Earth Sciences, Stanford University
- **William McDonough** — McDonough Braungart \Design Chemistry
- **Tony Michaels** — Managing Director, Proteus Environmental Technologies, LLC
- **Bill Post** — Former CEO and Chairman, Pinnacle West Capital Corporation
- **Brian Swette** — Chairman of the Board, Burger King
- **John Underwood** — Managing Director, Goldman Sachs
- **Sander van der Leeuw** — Director and Professor, School of Human Evolution and Social Change, ASU
- **Rob Walton** — Chairman, Wal-mart
- **Julie Ann Wrigley** — President, Julie Ann Wrigley Foundation

LEARN MORE

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