Oct 24th, 10:30 AM - 11:15 AM

# Engaging the community: The Metropolitan university

Jonathan Fink
*Arizona State University*

Shaping the Future of Southern Nevada:
Economic, Environmental, and Social Sustainability
October 24, 2007

# *Arizona State University and Metro Phoenix: Partnerships for urban sustainability*

Jonathan Fink
University Sustainability Officer
Director, Global Institute of Sustainability
Arizona State University

# Urban competitiveness linked to research universities

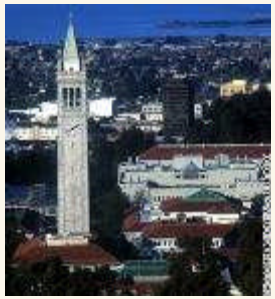
**Boston**

**MIT**

**Harvard**

**San Francisco**

**Stanford**



**UC Berkeley**

# Metro Phoenix and Arizona State University (ASU)

- Young, large, rapidly growing city
- Young, large, rapidly growing university
- Community increasingly willing to invest
- Investments lead to high-tech economic transition

**Phoenix**

**Arizona State University**

# Brief history of Phoenix economy

- City grew after World War II
- Economy initially based on agriculture, tourism
- Dominated today by construction, real estate
- Limited high tech: semiconductor mfg; some biotech
- Economic development roadmaps emphasize cleantech

# High-tech investments since 2000

- AZ voters: $1.4B over 20 years for university research
- Legislature: $400M for new research buildings
- Scottsdale: 40 acres plus $40M for SkySong
- Phoenix voters: $184M for new ASU campus
- Ira & Mary Lou Fulton: $160M in donations to ASU
- Legislature: $135M for Science Foundation Arizona
- Piper Trust: $50M for Biotech faculty recruitment
- Google's first university-based office opens at ASU

# Roles of Arizona State University

- Train high-tech workforce
- Contribute directly to economy
- Help inform decision-making
- Conduct cutting-edge research

# Arizona State University


- One of largest universities in U.S. (~ 63,000 students)
- Four campuses in metro Phoenix
- Founded in 1885; first PhD not until 1963
- 1 of 8 "Research 1" Universities w/o Med or Ag School
- From 3 to 13 National Academy members in 4 years

*Focus on interdisciplinary research that is socially relevant, use-inspired, globally engaged*

# *Nature* Editorial, April 26, 2007:
# ASU is "The university of the future"

nature

www.nature.com/nature Vol 446 | Issue no. 7139 | 26 April 2007

## The university of the future

The traditional model of the US research university — based on the pre-eminence of the single-discipline department — needs to be stretched and challenged.

The American research university is a remarkable institution, long a source of admiration and wonder. The idyllic, wooded campuses, the diversity and energy of the student populations, and, most of all, the sheer volume of public and private resources available to run them, have long made them the envy of the world.

Seen from the inside, however, everything is not quite so rosy. Setting aside the habitual complexity of medical schools, which have separate healthcare and finance issues, the structure of these institutions is straightforward and consistent. The bedrock of each university is a system of discipline-specific departments. The strength of these departments determines the success and prestige of the institution as a whole.

This structure raises a few obvious questions. One is the relevance of the department-based structure to the way scientific research is done. Many argue that in a host of areas — ranging from computational biology and materials science to pharmacology and climate science — much of the most important research is now interdisciplinary in nature. And there is a sense that, notwithstanding years of efforts to adapt to this change by encouraging interdisciplinary collaboration, the department-based structure of the university is essentially at odds with such collaboration.

A second set of issues surrounds the almost static nature of the departmental system. In a country where most things are highly fluid, the fields covered by departments, as well as the pecking order between them, have remained largely unchanged for many years. As people and money have flowed, particularly over the past twenty years, to the south and the southwest, the strongest US universities and departments remain embedded in the northeast and in California. League tables drawn up by the National Academy of Sciences and others show little movement in this pecking order, even over several decades.

Another, perhaps more contentious, issue concerns the relevance of the modern research university to the community it serves. The established model, whatever else its strengths and weaknesses, reflects the desire of the middle classes for an undergraduate training that prepares their offspring for a stable career. But how does it serve a society in which people may have to retrain and recreate their careers throughout their adult lives?

These questions are being asked thoughout American academia, but nowhere more searchingly than at Arizona State University (ASU), a huge public university that is expanding to meet the needs of the United States' fastest-growing major city (see page 968). Michael Crow, its president, is executing an ambitious plan to replace the traditional model with one in which both influence and research excellence are concentrated not in departments, but in large, broadly based interdisciplinary centres with clear commercial or societal goals.

**"There is a sense that the department-based structure of universities is essentially at odds with collaboration."**

Whatever its outcome, this experiment will not of itself uproot the traditional university system. Incremental change, notably the establishment of stronger multidisciplinary entities such as Bio-X at Stanford University in California, and several new centres at Harvard, may have a greater bearing on the overall development of the system.

But ASU's effort already tells us plenty about the likely direction of the research university in the up-and-coming regions of America. The university of the future will be inclusive of broad swaths of the population, actively engaged in issues that concern them, relatively open to commercial influence, and fundamentally interdisciplinary in its approach to both teaching and research. ■

# Metro Phoenix's quality of life is at risk

- Stressed water supply
- Worsening air pollution
- Traffic congestion
- Urban heat island effect
- Energy vulnerability
- Loss of open space

*How can we grow sustainably?*

# Global Institute of Sustainability (GIOS)

- Pan-university research federation has urbanization focus
- Includes first degree-granting School of Sustainability
- Oversees ASU's sustainable business/construction practices
- Partners: companies; federal, state, & municipal agencies

TIME

Aug. 10, 2007

# Getting Schools to Think and Act Green

Some schools have avoided such squabbles by making sustainability a part of the core academic mission. **One university at the vanguard of the trend is Arizona State, which aims to distinguish itself as a leading institution for interdisciplinary work focused on studying and producing global sustainability solutions.** ASU unveiled the nation's first school devoted to sustainability earlier this year, offering a certificate program, two master's, a PhD and starting next fall, two bachelor's degrees. It grew out of the sustainability initiative, launched by university president, Michael Crow, five years ago.

ASU is involved in a number of collaborative research projects between academic departments and local school districts, corporations, non-profit institutions and public agencies, covering such subjects as water management, environmental analysis of urban ecosystems and the history of socio-ecosystems in the Mediterranean. The home base for the research as well as the school is ASU's well-endowed three-year-old Global Institute of Sustainability. Says Fink, ASU's sustainability chief: **"We've been able to incorporate more of the university into a growing set of projects giving us knowledge about a complex and socially essential set of issues that are relevant in Arizona and around the world."**

# Broad participation by entire university is key

- Concentric rings of engagement involving all of ASU
- Expand opportunistically with new hires and grants
- Link environmental, social, economic, technical expertise
- Sustainability grants and projects from across all of ASU
- Sustainability classes and minors throughout ASU
- Sustainable business practices pursued by all ASU units

***GIOS role is to coordinate, initiate, integrate, promote***

**How can the study of urban systems be coordinated?**

HOUSING

HEALTH

POWER

WATER

URBAN SECURITY

How can the study of urban systems be coordinated?

MANUFACTURING

AIR

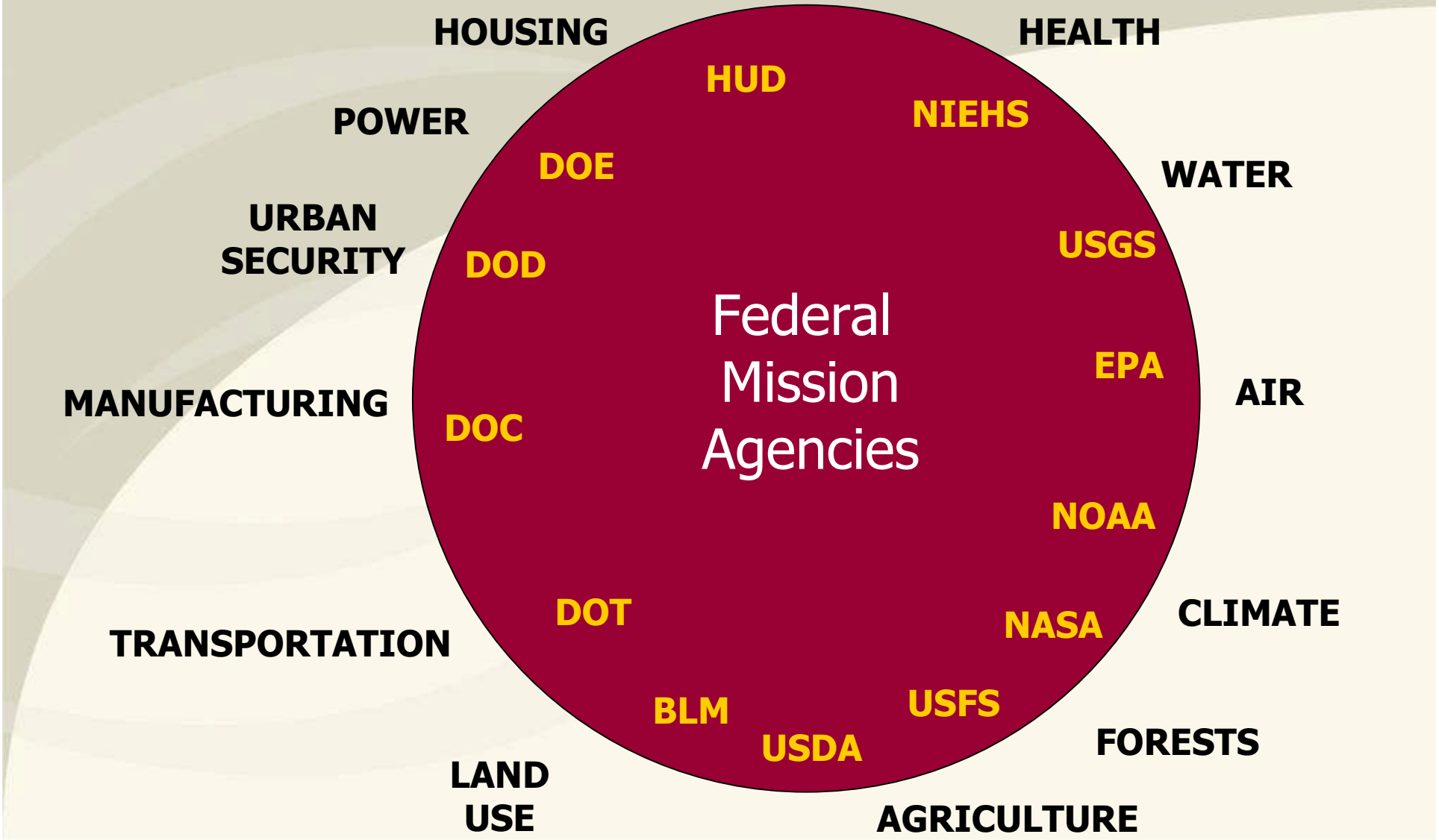
CLIMATE

TRANSPORTATION

FORESTS

LAND USE

AGRICULTURE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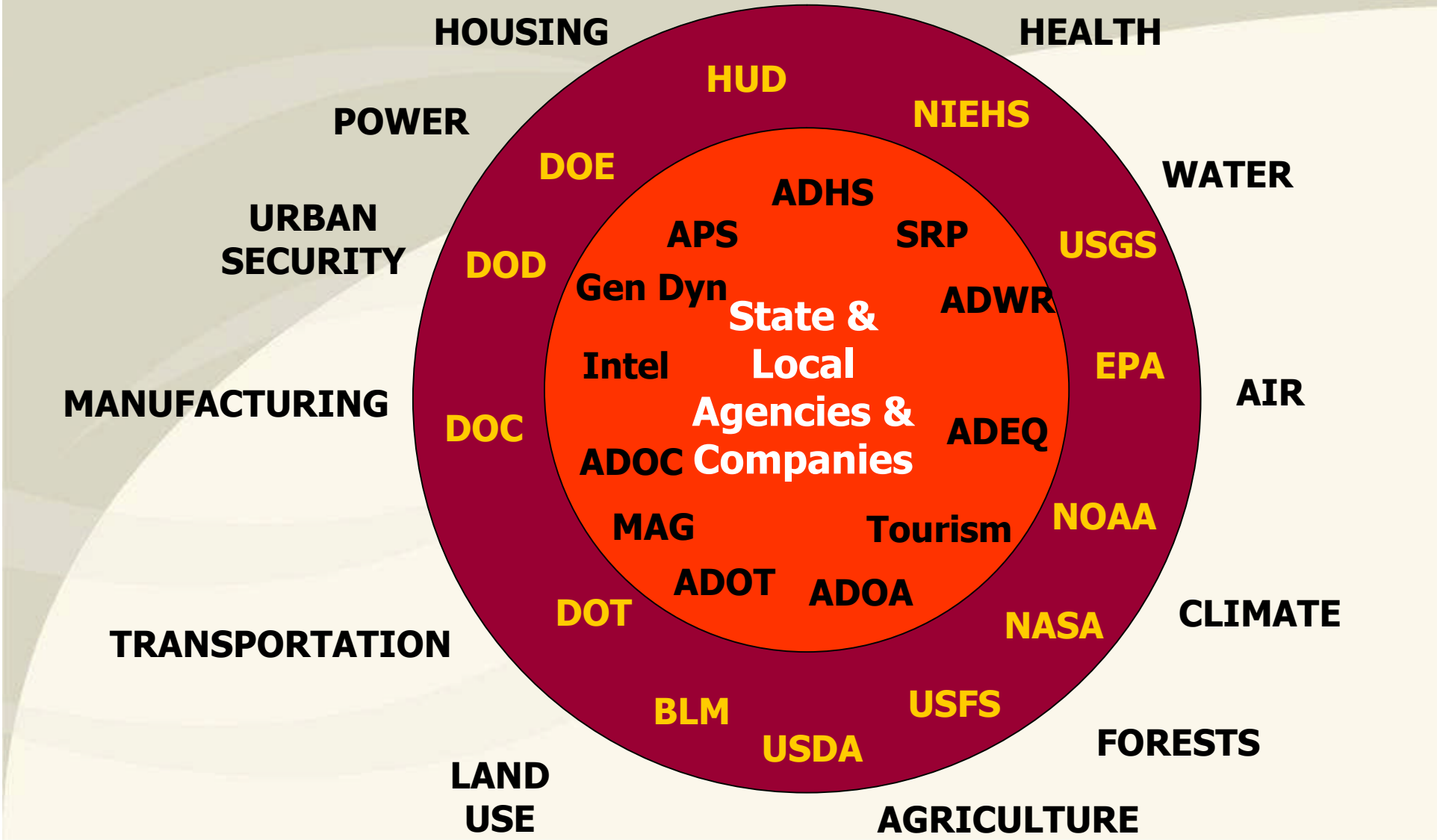
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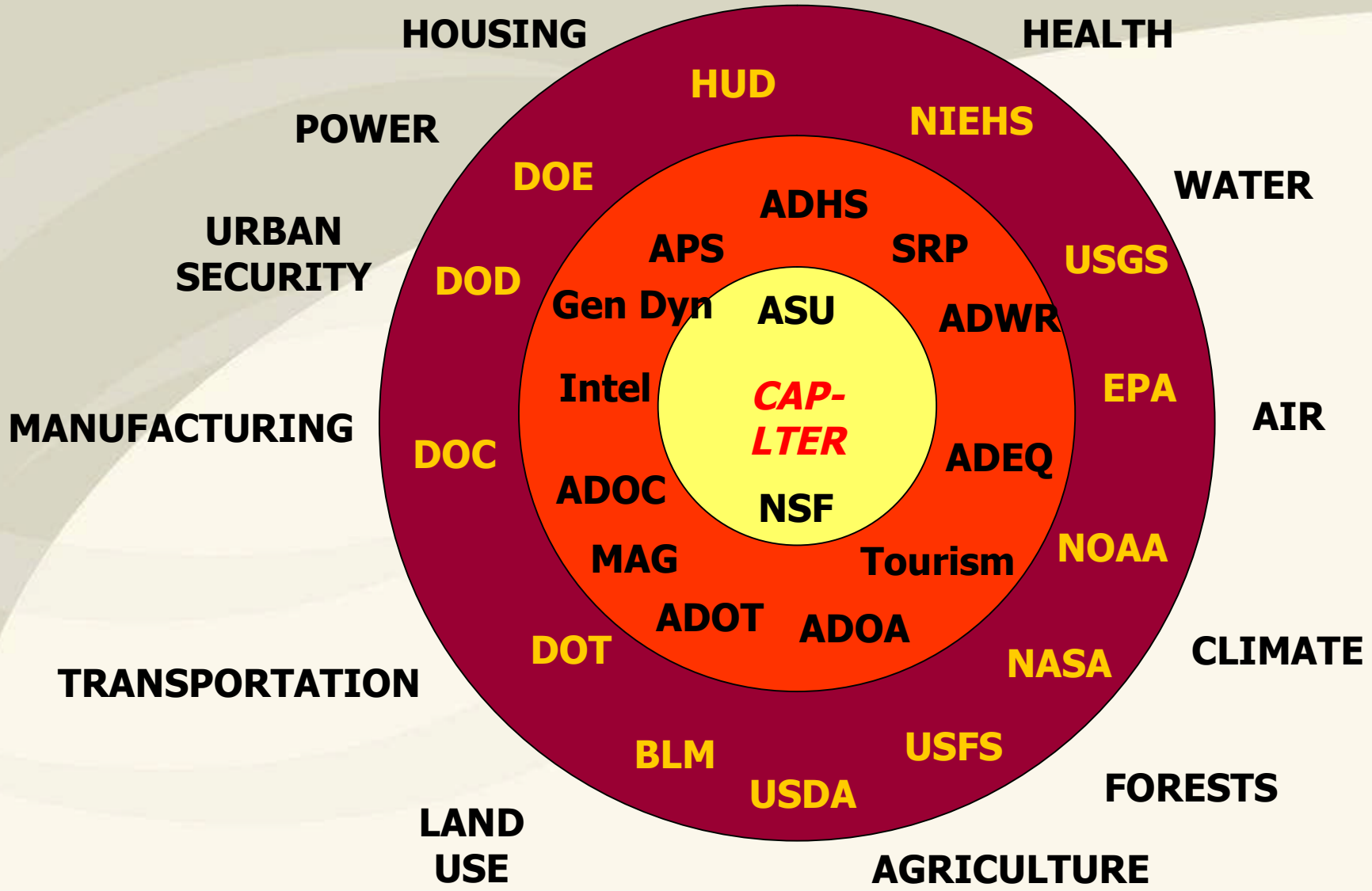
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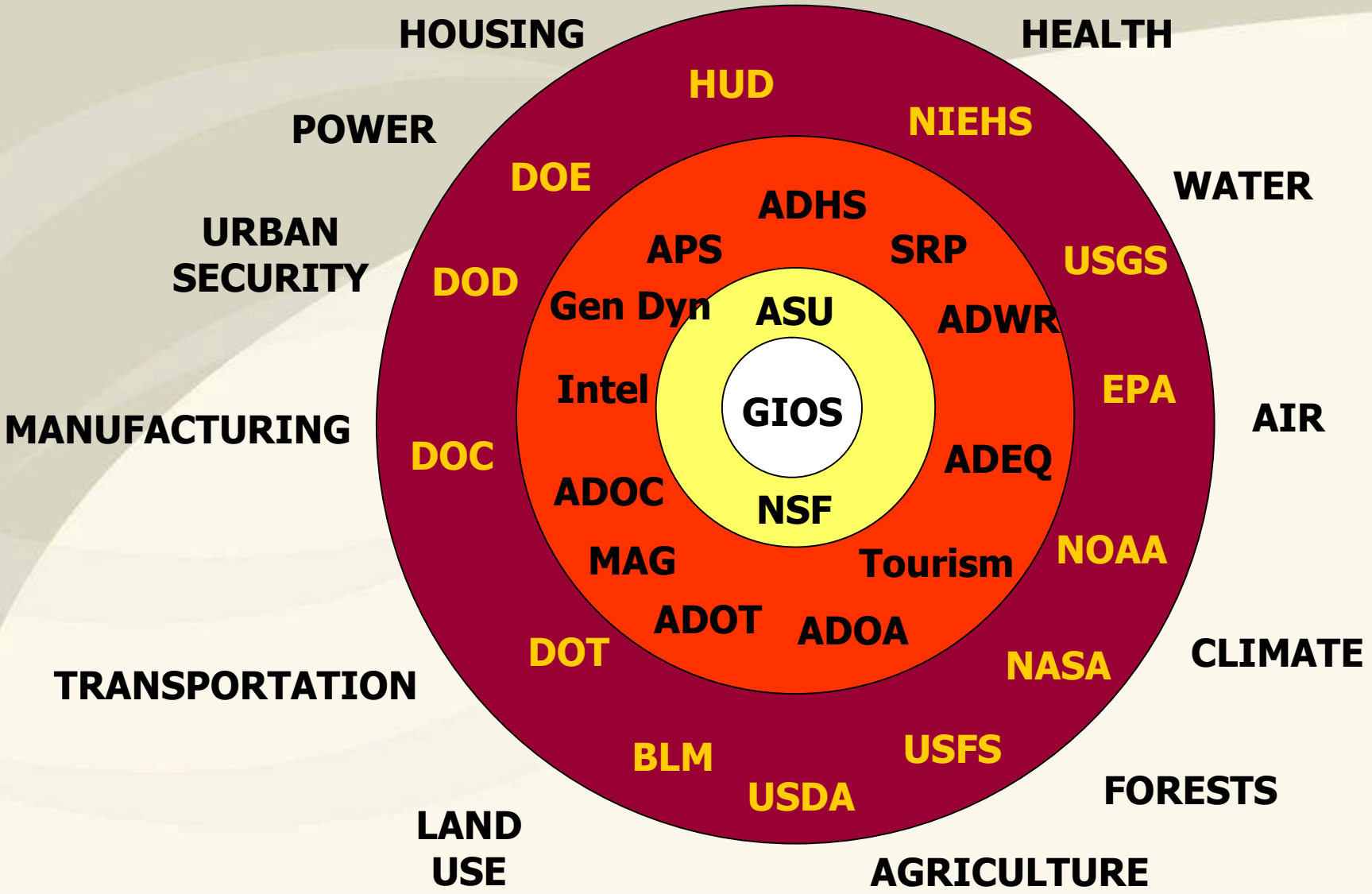
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GIOS
NSF

# ASU's urban environmental research assets

- CAP-LTER, one of two Urban LTERs
  - Human impacts on Phoenix ecosystem, and vice versa
- Urban Ecology IGERTs (NSF)
  - Trains next generation of urban scientists
- Agrarian-urban NSF Biocomplexity grant
  - Tracks urban growth into agricultural lands
- NASA (EOS) 100 Cities Project
  - Phoenix as hub of 100 cities network
  - Integrates remote sensing with urban resource management
  - Uses ASU/JPL Mars Space Flight Facility

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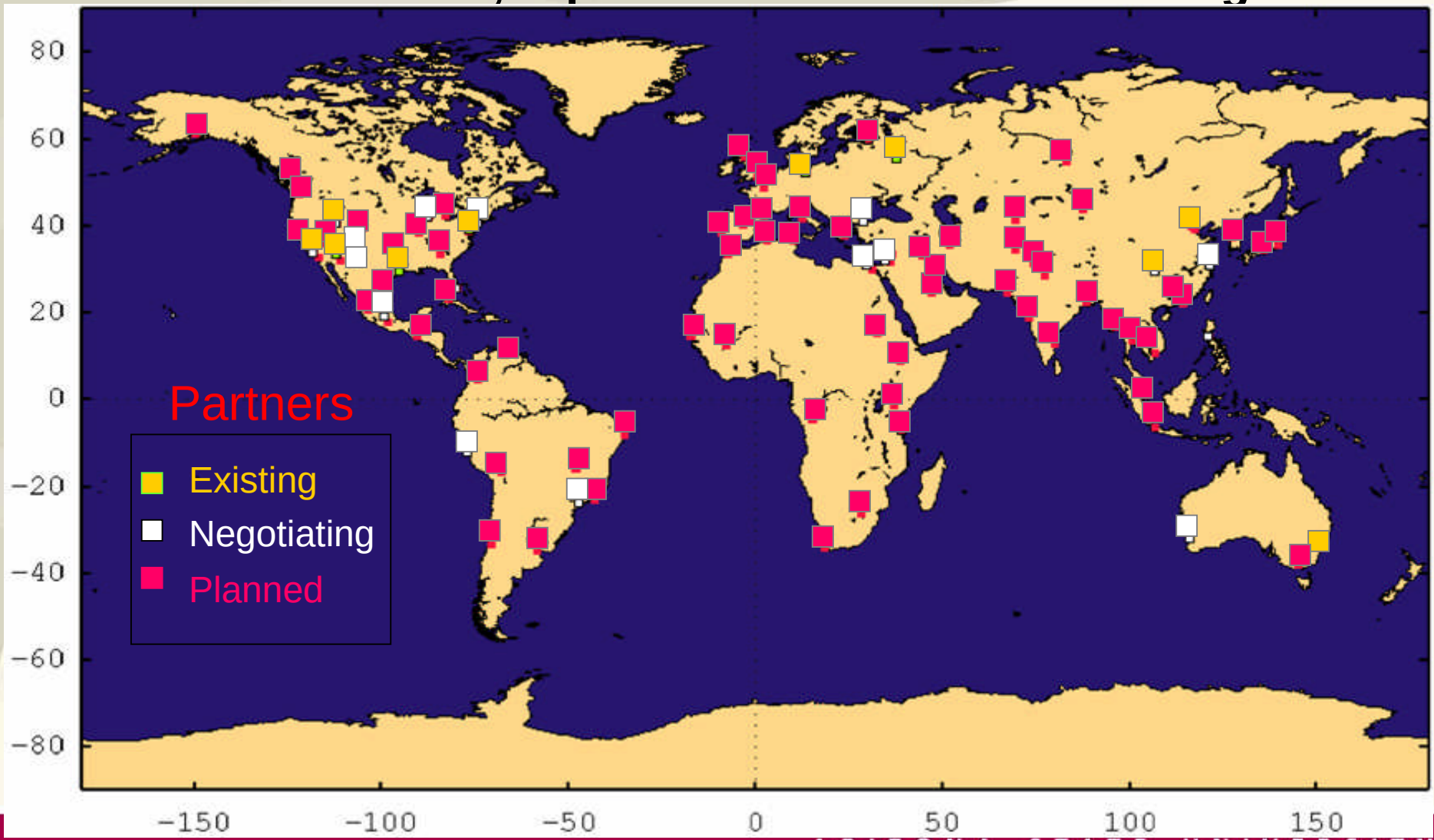
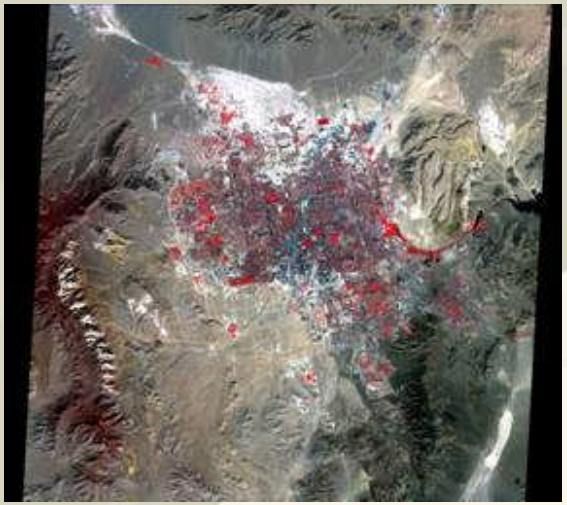
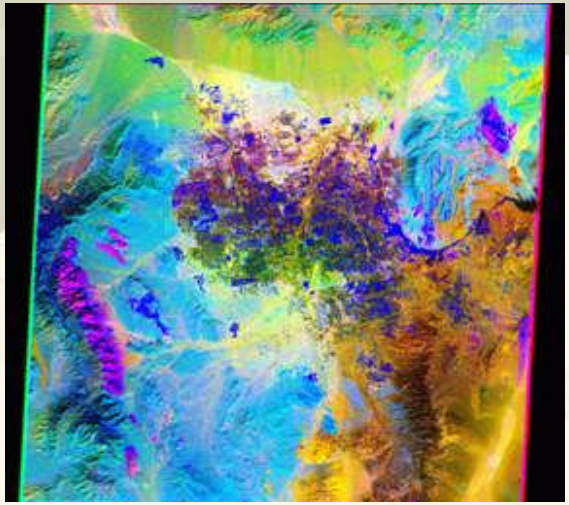
# 100 Cities Project:

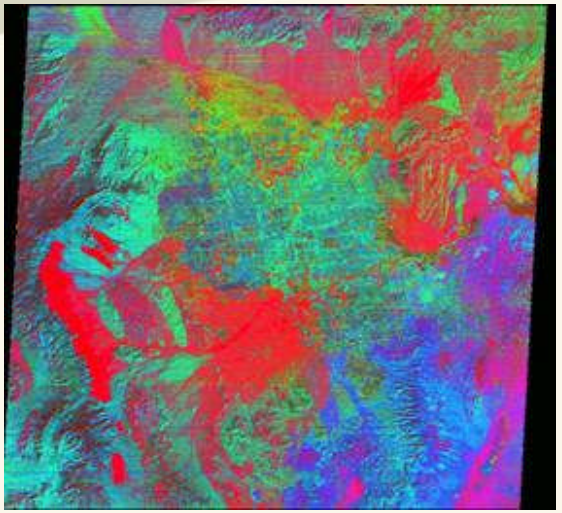
## Standardized, repeated urban remote sensing



# Different sensors = different information







*Las Vegas, NV, 17-Oct-2000*

Visible to near-infrared
15 m/pixel

- Major land cover classes
- Vegetation health
- Soil properties
- Soil contamination

Shortwave infrared
30 m/pixel

- Urban surface materials
- Rooftop materials
- Energy use
- Fugitive dust production
- Metal contamination

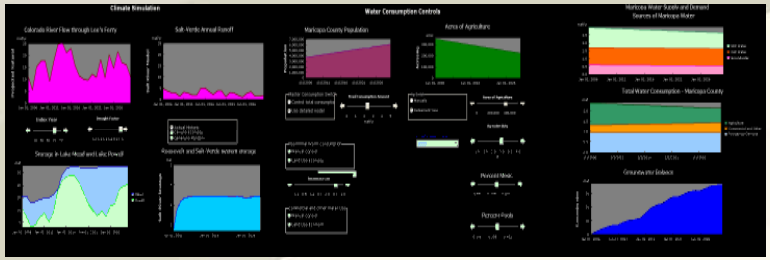
Thermal infrared bands
90 m/pixel

- Surface energy balances
- Regional climate models
- Anthropogenic heat sources
- Heat island development

# Decision Theater: Tool to help envision the future

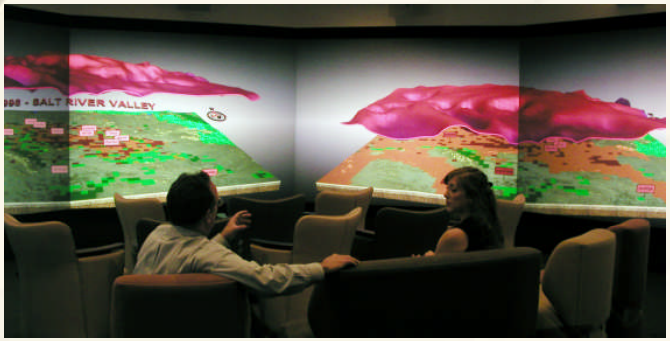
- High-end visualization
- Rapid simulation
- "What-if" scenarios
- Decision-making tools
- Access to university experts

# Decision Theater: Current Projects

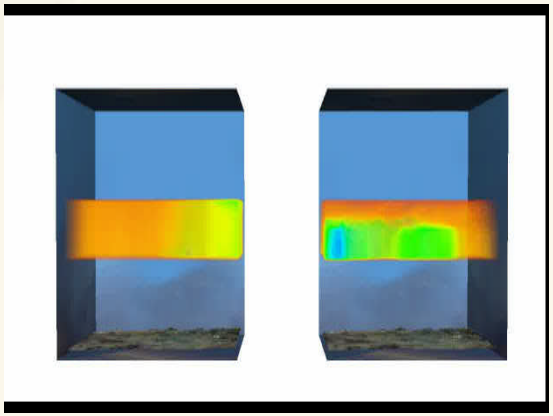


**Water supply and demand**

**Infrastructure planning**



**Urban heat island**



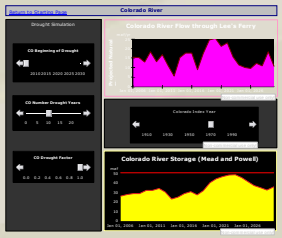
**Tracking air pollution**

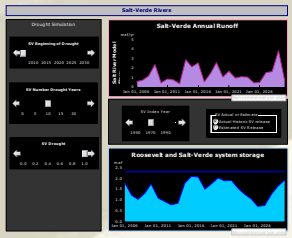
# Forecasting Water Supply & Demand

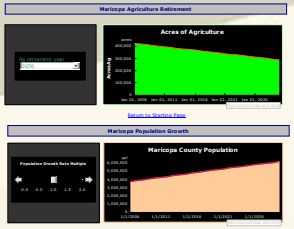
| Sponsor | Objective | Tools |
|---|---|---|
| **Decision Center for a Desert City, National Science Foundation** | **Developing a Comprehensive Water Model for Phoenix** | **System Dynamic Simulation Model; GIS** |

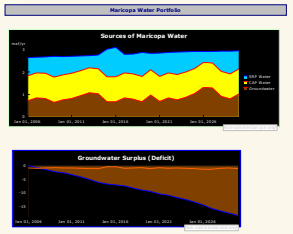
**Credit**: Dr. Tim Lant, Decision Center for a Desert City

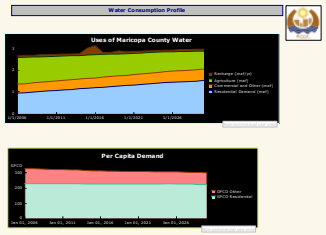
# Dynamic Water Supply & Demand Model

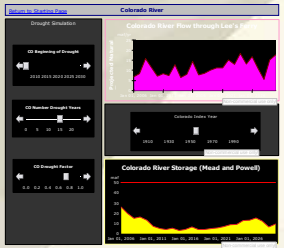


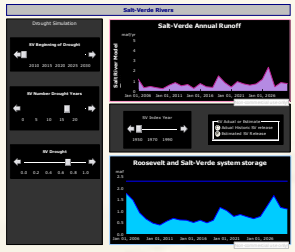



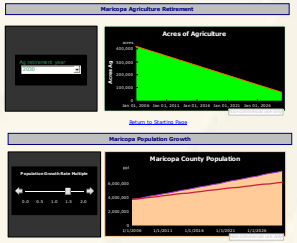



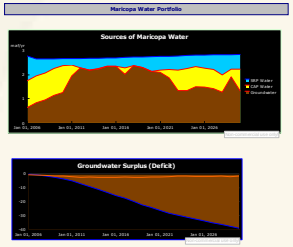



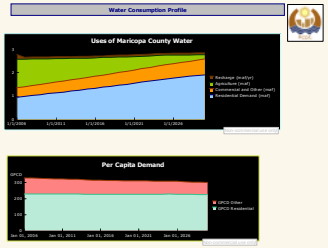




**Colorado River Supply**

**Salt-Verde River Supply**

**Land Use & Population**

**Water sources & Groundwater**

**Water Uses & Demand**

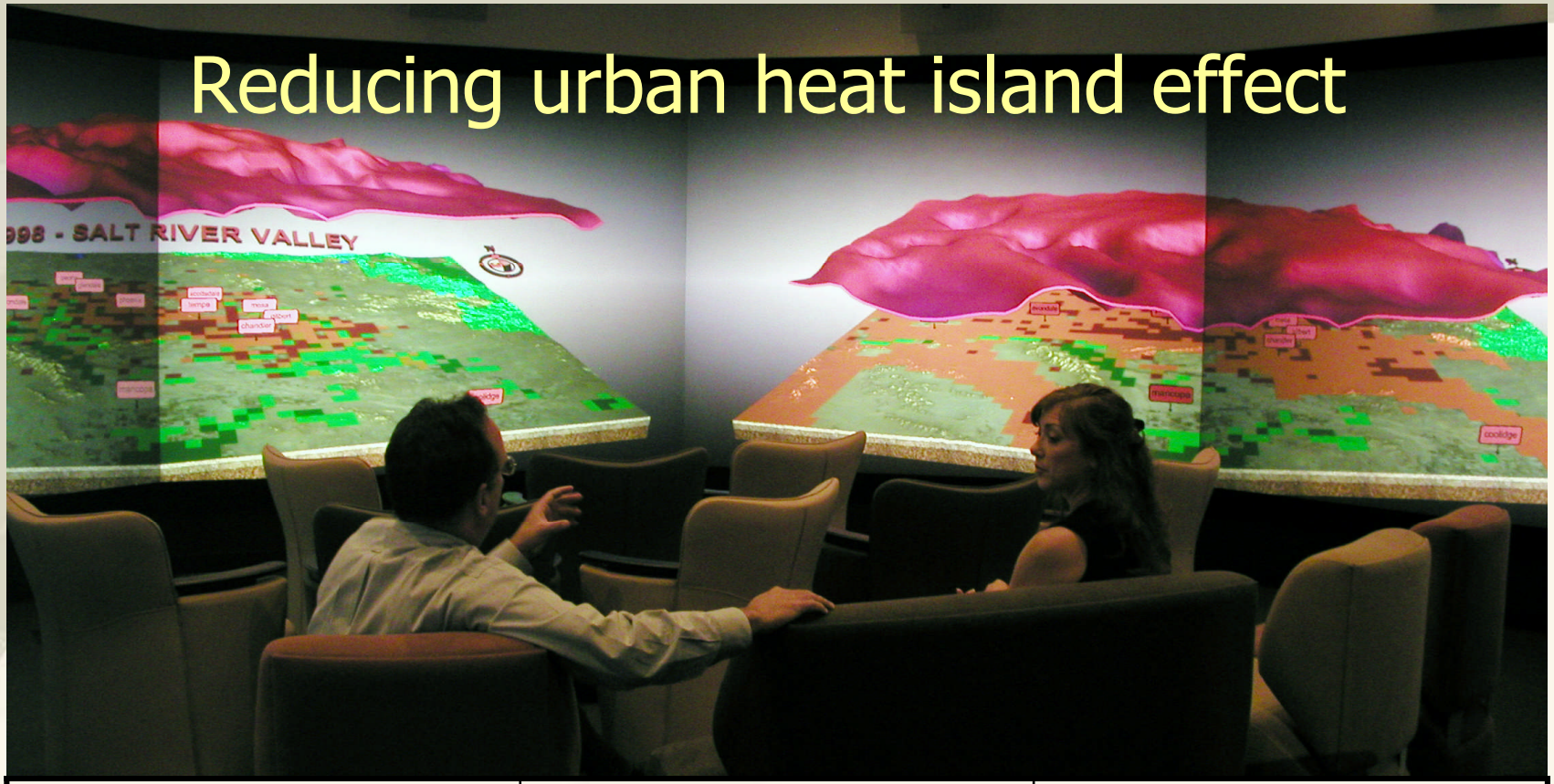
# 3D Planning for City of Tempe


| Sponsor | Objective | Tools |
|---|---|---|
| City of Tempe, Arizona | Improving zoning regulations for building heights | Stereo 3D City Model, Group Collaboration |

# 3D Planning for City of Tempe


**Credit**: City of Tempe, Arizona

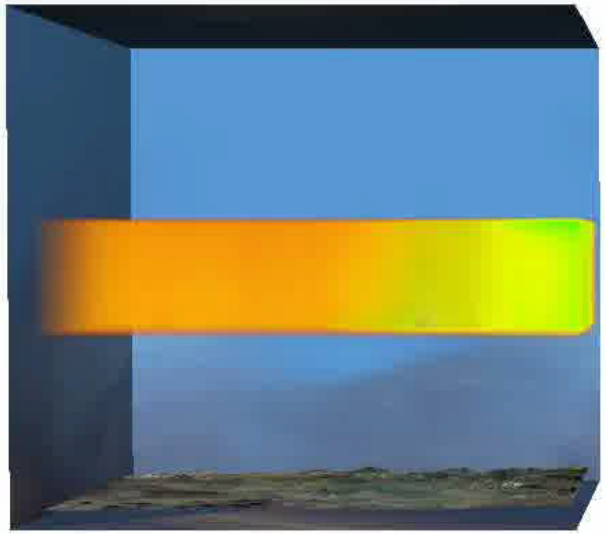
# Reducing urban heat island effect



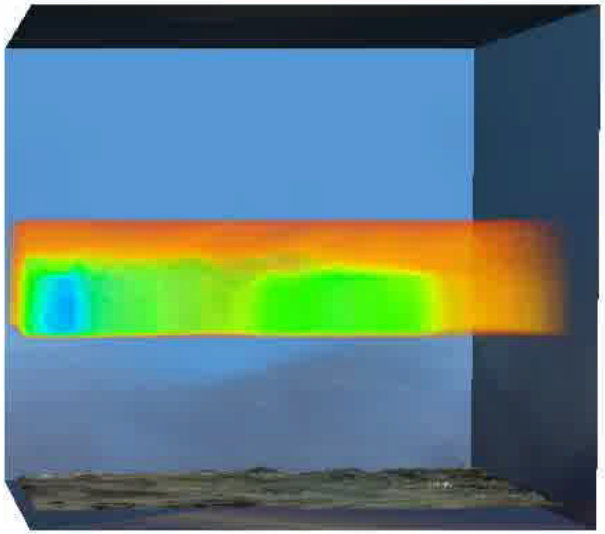

| Sponsor | Objective | Tools |
|---|---|---|
| U.S. Environmental Protection Agency | Predicting heat island effect in Phoenix | Land use modeling, Stereo 3D Atmospheric modeling |

# Tracking Phoenix air pollution

**Summer**



**Winter**



| Sponsor | Objective | Tools |
|---|---|---|
| Arizona Department of Environmental Quality | Understanding Phoenix air pollution | Stereo 3D pollution modeling |

# Summary

- Phoenix late entry in global, high-tech competition
- ASU assists Metro Phoenix with all aspects of sustainability
- University provides expertise, ideas, tools, workforce
- Global Institute of Sustainability aligns ASU & regional needs
- Decision Theater: Policy-making plus technology
- Lessons should be relevant to Las Vegas and UNLV