

Sustainable Future Scenarios for Central Arizona-Phoenix: Designed and visualized with 3D modeling

Brandon Ramierz, Melissa J. Davidson, Elizabeth M. Cook, David M. Iwaniec



A series of six different scenarios were developed through collaborative workshops with local community, municipal, and academic stakeholders. With this data we developed 3D models that highlight the iconic features within each scenario to create a visual representation of each future. These models are developed through a series of design tools and begin to take on a more tangible characteristic once visualized. These models convey the unique and data that generate each scenarios differing storyline. These are street level changes and details. For regional level changes, see Davidson et al. (Poster #13)

Transformative: Emerald City

There is a strong emphasis on balancing tradeoffs among strategies to address flood, drought, and heat



- Buildings designed to support vegetation and provide shade
- Increase in water harvesting to support outdoor irrigation
- Landscaping primarily xeric drought-tolerant
- Material to decrease heat massing and increase albedo
- 75% of 2015 freeways repurposed into alternative green transport corridors

Adaptive Drought: The True Cost of Water

Long-term water security focusing on conservation and banking



- Aggressive water conservation targets
- High priority on water security: banking
- Centralized stormwater and water reuse infrastructure
- Reduction in large scale peri-urban agriculture
- Shift in energy sourcing → solar
- Advanced metering, smart leak detection, and other water conservation technologies

Transformative: Almost Zero Waste

A central theme of this scenario is resource self-sufficient and reuse of waste (energy, water, material)



- 100% of energy demand is achieved decentralized solar infrastructure
- Emphasis on water capture and reuse to support urban agriculture and local vegetation
- Adaptive reuse of resources and materials is the primary mechanism to reduce waste (e.g., shipping container apartments, local-scale composting)
- Transportation and green infrastructure extended to currently underserved areas
- Residents live within 20 minutes of 80-90% of their needs

Adaptive Flood: The Desert Wetland

Multi-scalar network of floodplains, parks, and transportation system (local → regional hydrologic connectivity)



- Neighborhood-scale wetlands & “linear” parks are supplied by household graywater in dry times and stormwater during precipitation events
- Individual properties utilize green infrastructure, bioswales, and rain barrels to capture as much stormwater as possible
- Shift to “bottom-up” local-scale governance, stewardship, and responsibility
- While density does not change drastically there is a significant reduction in impervious surfaces city-wide
- Average canopy cover is 25%

Transformative: Healthy Harvest Hubs

A radical re-envisioning of urban form to optimize city function



- Urban form configured around 3 distinct types of hubs: dense urban, large-scale agriculture, and solar farms
- Concentration, redistribution and stratification of population and ecosystem services
- High connectivity of people and goods between hubs
- Increase in urban hub density
- Overall urban extent has been greatly reduced much of it being converted to desert or new agriculture
- Restoration of vast expanses of desert

Adaptive Heat: Cool it or Lose it

Heat equity addressed with green and gray infrastructure



- Massive increase in shade cover (25% green, 25% gray)
- Multi-modal transportation network consists of distributed greenways, canalscape, and light rail
- Buildings are designed to support vegetation, provide shade, and reduce heat massing
- Sprawl development has decreased and unnecessary pavement has been replaced with other, less heat retaining materials

Acknowledgements: Thank you to Nancy Grimm and Paul Coseo for their support of this work.