Pima County
Local Drought Impact Group (LDIG)

Vulnerability Assessment in Drought Mitigation

Arizona is one of twelve states with a mitigation based drought plan. Disaster management, and corresponding research, has evolved over the years from short-term crisis response to more long range, proactive risk management planning for expected impacts, or mitigation. The goal of mitigation is to reduce vulnerability to a range of identified risks ahead of time.

Vulnerability, in its research definition, is composed of three characteristics: Exposure, Sensitivity and Adaptive Capacity.[1] Exposure is the probability of a certain area to experience a hazard- drought- and to what magnitude and duration. Drought maps produced by the US Drought Monitor and the Arizona Monitoring Technical Committee record current and past drought exposure. Sensitivity is somewhat self-explanatory, as the degree to which a system or sector can be altered or will respond after exposure. Adaptive capacity refers to a system's ability to adjust and mitigate primary and secondary impacts. Important to adaptive capacity is the ability to collect reporting on all order of impacts across many sectors, a key function of drought impact assessment groups, such as LDIG.

In reviewing planning practices, Colorado's Hazard Mitigation and Drought Response Plan is mentioned in multiple studies as an example of an effective plan. The 2013 update, approved in September, includes a revised vulnerability assessment and tools to rank individual counties within different sectors. Applied to their drought planning process, vulnerability is a determination after "assessing the threat from potential drought hazards to various sectors across social, economic, environmental, and political fields." A vulnerability assessment is defined as a "process of identifying, quantifying, and prioritizing (or scoring) the vulnerabilities in a system."[2]

A similar vulnerability assessment of Pima County would help inform the drought update process by reviewing the county's historical exposure, listing the natural resource and environmental, economic, social, and municipal sectors deemed sensitive, determining the size and relative importance of those sectors to the county, and exploring the county's adaptive capacity to mitigate impacts, primary and secondary, to these sectors.

[1] McCarthy, Canziani, Leary, Dokken, White; *Climate Change 2001: Impacts, Adaptation and Vulnerability.* Cambridge University Press, 2001.
[2] Colorado Drought Mitigation and Response Plan, Annex B. 2013

Pima County's Vulnerability to Drought and Response Framework

1. Pima County Vulnerability Assessment
    a. Vulnerability Defined
        i. Exposure- Probability of a defined area, magnitude and duration
            1. Mapped by short/long term State MTC status maps
            2. Historical Exposure
        ii. Sensitivity- Ability to absorb/manage impacts w/min loss
            1. County Assets
                a. County Land
                    i. Pima County's Critical Habitat and Plans
                        1. SDCP, MSCP-Sec 10 and Open Space Lands
                            a. Monitoring
                    ii. Scenic (Tourism) Properties, Environmental Projects and Trails
                    iii. Ranches and Range
                b. Parks, Golf Courses & Ball fields
                c. Effluent, Water Rights, Credits and Wells
            2. Natural Resources & Environment
                a. Habitat Loss & Decreased Biodiversity
                    i. Habitat Type most Drought Sensitive
                b. Stream flow, Water table and Soil moisture Loss
                c. Wildfire Threat & Forest Health
                d. Animal Morbidity and Mortality, Disruption
                e. Water Quality
            3. Economy
                a. Economic Sectors Defined as Drought Sensitive
                    i. Agriculture and Ranching
                        1. Crops, Dry land and Irrigated
                            a. 2nd Order- Animal Feed Crops
                        2. Livestock
                        3. Green Industry, Agricultural Events & Tourism
                    ii. Energy
                        1. Power Generation
                        2. Mining
                    iii. Forestry and Logging Industry
                    iv. Hunting, Fishing, Camping and Outdoor Recreation
                    v. Tourism and Sports
                b. Pima County's Economic Sectors
                    i. Portion of Economy Drought Sensitive
                    ii. Individual County Sector Reports
                    iii. Historically Performance during Drought
            4. Social
                a. Secondary Economic Impacts
                    i. Support industries for impacted sectors

ii. Multiplier effect
iii. Unemployment, relocation
iv. Quality of life & tax base decline, poverty, crime

b. Public and Mental Health
i. Drinking water and air quality
ii. Mosquito borne illness
iii. Stress and depression

5. M&I
a. Urban Economic Growth Centers
b. Tucson Water vs other Providers
i. Reliability w/legal right, appropriation and delivery
ii. Individual Drought Plans
iii. Public Education

iii. Adaptive Capacity- Ability to adjust/moderate loss- Cope
1. County's Role in Adaptive Capacity
a. NOT a Water Provider
b. Water Credit Generation (Effluent)
i. Water Rights, Type I & II
c. Water Reclamation and Re-Use
d. Water Quality- ROMP
e. Air Quality- PCDEQ
f. Public Health
g. Land Use & Building Code Enforcement
h. RFCD- Stormwater, Riparian and Recharge Management
i. Habitat Conservation & Monitoring- SDCP
j. Drought Response- LDIG
2. County Ability to Record Impacts- Impact Assessment Group- LDIG
3. County Effectiveness of Mitigating 1st/2nd/3rd order impacts by Sector

iv. Vulnerability Summary

2. Pima County Drought Response Framework
a. State Framework
b. County Level
i. LDIG
ii. Ordinance
c. Recommendations for County Framework based on Vulnerability Assessment