Online Ethics Center
FOR ENGINEERING AND SCIENCE

Case Study: Climate Change Adaptation and Public Participation in Yuma, AZ

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Description

This case explores ethical issues in public engagement activities about issues of climate change mitigation. In particular, it presents hypothetical citizens' forums in Phoenix and Yuma, Arizona, and, through discussion questions, identifies many of the issues for consideration these kinds of activities entail.

Abstract

This case study is part of a larger collection of Life and Environmental Science ethics education resource sets on ethics of emerging biotechnologies, big data in the life sciences, human enhancement, and biodiversity. Doctoral students from Arizona State University’s Center for Biology and Society developed the resources under the direction of Karin Ellison and Joseph Herkert between 2014 and 2019.

Body

One day during her morning twitter-scroll, Callie Evans, a professor of anthropology at Arizona State University (ASU) in Tempe, Arizona, observes a tweet from the

Arizona Science Center calling for Phoenix-area residents to participate in a citizen's forum regarding climate change resilience in the city. The forum, hosted by the Science Center, initiated by the ASU researchers, and funded by the National Oceanic and Atmospheric Administration (NOAA), aims to engage the citizens of Phoenix in a deliberation around adaptation to and mitigation of extreme heat and drought. Phoenix is expected to experience a growing number of days during which the temperature exceeds 100 degrees F, as well as less predictable rainfall that could result in prolonged periods of drought (Yardley 2017).

Callie is curious to explore the possible impacts of climate change on infrastructure, ecosystems, and social and cultural networks in Phoenix, as well as to deliberate on potential strategies to address those challenges. Her interest stems from her experience in her hometown of Yuma, Arizona; she's been tracking the impacts of climate change there since she was young and growing up on her family's broccoli farm. The forum in Phoenix could shed light on strategies for the similar scenario in Yuma. Callie applies, and three weeks later she learns that she has been selected to participate.

On the day of the forum, almost 70 people from around the Phoenix metropolitan area convene under the leadership of the ASU researchers to design and debate different strategies for adaptation and mitigation. Participants use game-boards, role-play, and visualizations from NOAA's satellite system to learn about the potential impacts of extreme heat and drought, as well as to explore the perspectives of various hypothetical stakeholders including politicians, business owners, environmentalists, and farmers. After the exploratory first stage, participants then share their own perspectives, in private journals as well as in discussion with their group, and they collaborate to make recommendations for supporting the resilience of Phoenix to climate change. Callie excitedly notes the presence of Phoenix city officials, who have attended to learn about the concerns, preferences, and ideas of their constituents.

Although she does not yet know what impact the citizen forum will have on Phoenix's decision-makers in the coming weeks and months, Callie feels empowered: Her participation broadened her knowledge base, challenged her to understand divergent perspectives, and led her to better articulate her own point of view in deliberation with others to reach compromise. Thus, Callie feels there is potential for a similar forum to initiate productive dialogue among the conflicting communities facing climate change challenges in Yuma.

With an average of 350 sunny days per year, Yuma is an agricultural oasis engineered amid its desert surroundings through irrigation. Farmers in the area produce around 90% of the United States' winter supply of lettuce and other leafy vegetables (Satran 2017). The city and county of the same name lie at the southwestern corner of Arizona, bordering California Mexico, and are home to almost 95,000 people and more than 200,000 acres of crop-land (US Census Bureau 2017; USDA 2012).

Both county and city rely on the contested waters of the Colorado River, which meanders along the county's western edge and north of the city before crossing the border into Mexico and flowing toward the Gulf of California. Political conflict has long been part of the story of the Colorado River. To this day there are conflicts over water rights among local stakeholders, US states, and nations. Layered on top of the complex legal and environmental history, climate change, in the form of prolonged drought and extreme heat in the river's Upper Basin, has contributed to looming shortages for many who rely on the river's waters, including Las Vegas, Phoenix, Yuma, and Denver, the Hoover Dam power plant, and adjacent ranching and agricultural lands (Udall and Overpeck 2017; Harvey 2017; DOI 2018).

There are also direct, local impacts of climate change on the city of Yuma and the surrounding agricultural landscape. For example, the increasing number of days reaching temperatures of more than 100 degrees F will lead to a shorter growing season for many crops which could damage the winter vegetable market that drives most of the Yuma county economy (Dewey 2017; Charles 2017; Yuma County Chamber of Commerce 2018). More days above 100 degrees F may also lead to increased heat-caused illness and death, as well as greater air conditioning and peak-hour energy demands (Wehner, Castillo, and Stone 2017; Luber and McGeehin 2008). In addition, increased temperatures can cause wear and tear on infrastructure for transport and energy (CCSP 2008, p ES-5). Unpredictable rainfall and prolonged drought may lead Yuma to compete for water rights with the agricultural sector which currently holds priority when water is scarce (National Drought Mitigation Center 2018; Yardley 2015). And though the daily average of rainfall is expected to decrease, monsoons may become more intense, driving more pronounced dust storms and storm damage to infrastructure during the monsoon season (Luong et al. 2017).

Callie wonders how the city and the surrounding county will address the impacts of climate change. Thus, she sets out to organize a Yuma citizen's forum, but she

needs some help with a few questions first: What options exist? Who will decide? Will the urban and agricultural communities reach an understanding? …

Abbreviated Version:

During her morning twitter-scroll, Callie Evans, a professor of anthropology at Arizona State University, observes a tweet calling for participation in a citizen's forum aiming to engage citizens of Phoenix in deliberating on strategies for climate change. Phoenix is expected to experience more days exceeding 100 degrees Fahrenheit, as well as less predictable rainfall that could result in prolonged periods of drought. Callie is curious to explore the possible impacts of climate change due to her experience in her hometown, Yuma, Arizona; she's been tracking the impacts of climate change there since she was young and growing up on her family's farm. The Phoenix forum could shed light on strategies for Yuma. Callie applies and is accepted.

On the day of the forum, participants use game-boards, role-play, and visualizations to learn about the impacts of extreme heat and drought and to explore the perspectives of various hypothetical stakeholders. Next, participants share their own perspectives and collaborate to make recommendations. Callie notes the presence of Phoenix city officials, who have attended to learn from their constituents. Although she does not know what impact the forum will have on those decision-makers, Callie feels empowered: Her participation broadened her knowledge, exposed her to divergent perspectives, and challenged her to find compromises. Thus, Callie feels there is potential for a forum to initiate productive dialogue among the conflicting communities facing climate change challenges in Yuma.

Yuma is an engineered agricultural oasis. Farmers in the area produce around 90% of the United States' winter supply of leafy vegetables. Yuma and the surrounding agricultural lands rely on the waters of the Colorado River, but historical legal conflicts, prolonged drought, and extreme heat in the river's Upper Basin have led to looming water shortages. There are also direct, local impacts of climate change on the city of Yuma and the surrounding agricultural landscape. For example, the increasing number of days reaching temperatures of more than 100 degrees F will lead to a shorter growing season, which could impact the winter vegetable market that drives most of Yuma's economy. Such heat will also necessitate increased

reliance on air conditioning systems contributing to higher energy costs, as well as to wear and tear on infrastructure for transport and energy. Further, the city will compete for water rights with the agricultural sector which currently holds priority when water is scarce.

Callie wonders how the city and the surrounding county will address the impacts of climate change. Thus, she sets out to organize a Yuma citizen's forum, but she needs some help with a few ethical first: What options exist? Who will decide? Will the urban and agricultural communities reach an understanding? …

Discussion Questions:

Organizing:

1. Who should Callie cooperate with to initiate the forum? What are the pros and cons of organizing the forum with: City officials? A citizens' activist group? ASU researchers? An agricultural company or farmer's group? Others? Assess her options in comparison with how the Phoenix forum was organized.
2. Who should fund the forum? Compare Callie's options to the organizers and funders of the Phoenix forum.
3. How should Callie and her team recruit participants? What does proper representation look like? How can she work to ensure proper representation of the diverse communities in the city and the broader county?
4. Given proximity to the national and state borders, should representatives from California and Mexico be present at the Yuma forum? Why or why not?

Framing:

5. How might content framing differ depending on the sponsoring and the hosting group(s)?
6. How should the Yuma forum discuss the sensitive issue of water rights? Who is responsible for the diminishing waters of the Colorado? Who is responsible for adaptation strategies and funding?
7. How should scientific ideas be communicated to the participants?

Outcomes:

8. How should the results of the forum be used and by whom? Why?

9. Should city officials be present at the Yuma forum, like they were in Phoenix? What if decisions from the citizen forum differ from the preferences of the city and county officials? Whose opinion has more weight?
10. What if city officials choose not to use the results of the forum? Is the benefit to individual participants, described by Callie, enough to justify the costs of hosting the forum?
11. Is a forum the proper format for deliberating on these issues? Could the diverse values of participants result in gridlock around adaptive strategies? What other issues might arise?
12. Phoenix and Yuma face similar climate change challenges, but how and why might the process and outcomes of the forum in Yuma be different from those Callie experienced in Phoenix?
13. What might be the benefit of a local perspective relative to a global perspective regarding adapting to and mitigating climate change, which is often framed as a global issue?

Bibliography:

Adger, Neil w., Suraje Dessai, Marisa Goulden, Mike Hulme, Irene Lorenzoni, Donald R. Nelson, Lars Otto Naess, Johanna Wolf, and Anita Wreford. 2008. “Are there social limits to adaptation to climate change?” *Climate Change* 93: 335-354.

CCSP. (2008). Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I (p. 445). Washington, DC: U.S. Climate Change Science Program.

Charles, Dan. 2017. “Sorry, Salad Lovers: We May Have No Mesclun Mix (For Two Weeks).” *NPR*. March 1, 2017. Available at: https://www.npr.org/sections/thesalt/2017/03/01/517066531/sorry-salad-lovers-we-may-have-no-mesclun-mix-for-two-weeks?utm_campaign=storyshare&utm_source=twitter.com&utm_medium=social

Dewey, Caitlin. 2017. “What climate change has to do with the price of your lettuce.” *Washington Post*. March 3, 2017. Available at: https://www.washingtonpost.com/news/wonk/wp/2017/03/03/what-climate-change-has-to-do-with-the-price-of-your-lettuce/?noredirect=on&utm_term=.34c09e6c6fab

Felt, Ulrike and Maximilian Fochler. 2008. “The bottom-up meanings of the concept of public participation in science and technology.” *Science and Public Policy* 35(7): 489–499.

Gardiner, Stephen M. 2004. “Ethics and Global Climate Change.” *Ethics* 114: 555-600.

Grubb, Michael. 1995. “Seeking Fair Weather: Ethics and the International Debate on Climate Change.” *International Affairs (Royal Institute of International Affairs 1944-)* 71(3): 463-496. Public by Oxford University Press on behalf of the *Royal Institute of International Affairs*

Harvey, Chelsea. 2017. “Climate change is already reducing flows in the Colorado River, scientists report.” *The Washington Post*. February 27. Available at: https://www.washingtonpost.com/news/energy-environment/wp/2017/02/27/climate-change-is-already-reducing-flows-in-the-colorado-river-scientists-report/?utm_term=.abcec0b77188

Jones, Richard. 2006. “What have we learned from public engagement?” *Nature Nanotechnology* 2: 262-263.

Luber, G., & McGeehin, M. (2008). Climate Change and Extreme Heat Events. American Journal of Preventive Medicine, 35(5), 429–435. https://doi.org/10.1016/j.amepre.2008.08.021

Luong T. M., C. L. Castro, H-I. Chang, T. Lahmers, D. K. Adams, et al. 2017. “The More Extreme Nature of North American Monsoon Precipitation in the Southwestern United States as Revealed by a Historical Climatology of Simulated Severe Weather Events.” *Journal of Applied Meteorology and Climatology* 56: 2509–2529. Available: http://dx.doi.org/10.1175/JAMC-D-16-0358.1.

National Drought Mitigation Center. 2018. “United States Drought Monitor: Arizona.” Available at: http://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?AZ

Paavola J. (2008). Science and social justice in the governance of adaptation to climate change. Environmental Politics 17: 644-659.

Rosenzweig, Cynthia, William Solecki, Stephen A. Hammer and Shagun Mehrotra. 2010. “Cities lead the way in climate-chang action.” *Nature* 467: 909-911.

Rosenzweig, Cynthia. 2011. “All Climate is Local.” *Scientific American*, September 2011.

Satran, Joe. 2017. “This is Where American Gets Almost All Its Winter Lettuce.” *Huffington Post*, December 6, 2017. Available at: https://www.huffingtonpost.com/2015/03/04/yuma-lettuce_n_6796398.html

Udall, Bradley, and Jonathan Overpack. 2017. “The twenty-first century Colorado River hot drought and implications for the future.” *Water Resources Research* 53(3): 2404-2418.

US Census Bureau. 2017. “Quick Facts: Yuma City, Arizona; Yuma County, Arizona.” Available at: https://www.census.gov/quickfacts/fact/table/yumacityarizona,yumacountyarizona/PST12021

US Department of Agriculture (USDA). 2012. “Yuma Country Profile.” *2012 Census of Agriculture.* Available at: https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Arizona/

US Department of the Interior (DOI). 2018. “Drought in the Colorado River Basin.” *U.S. Department of the Interior.* Available at: https://www.doi.gov/water/owdi.cr.drought/en/

Wehner, M., F. Castillo, and D. Stone. “The Impact of Moisture and Temperature on Human Health in Heat Waves.” *Natural Hazard Science* April 2017. Available at: http://naturalhazardscience.oxfordre.com/view/10.1093/acrefore/9780199389407.001.0001/a9780199389407-e-58

Yardley, William. 2015. “Shrinking Colorado River is a growing concern for Yuma farmers — and millions of water users.” *The Lost Angeles Times* July 18. Available at: http://www.latimes.com/nation/la-na-sej-colorado-river-arizona-20150719-story.html

Yardley, William. 2017. “A building boom and climate change create an even hotter, drier Phoenix.” *The Lost Angeles Times* March 27. Available at: http://www.latimes.com/nation/la-na-phoenix-climate-adapt-20170327-story.html

Yuma County Chamber of Commerce. 2018. “Agriculture.” Available at: https://www.yumachamber.org/agriculture.html

Links:

Global Covenant of Mayors for Climate and Energy:
https://www.globalcovenantofmayors.org/

C40 Cities Climate Leadership Group:
http://www.c40.org/

World Mayors Council on Climate Change:
http://www.worldmayorscouncil.org/

Arizona State University Public Forums Project:
https://cspo.org/research/science-center-public-forums-community-engagement-for-environmental-literacy-improved-resilience-and-decision-making/

Notes

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Resource Type

Case Study / Scenario

Topics

Climate Change
Communicating Science and Engineering
Controversies
Cultural Awareness and Sensitivity
Environmental Justice
Responsible Innovation
Sustainability

Discipline(s)

Life and Environmental Sciences