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Stimulating Innovation Through the Challenges and Prizes Program From the U.S. Environmental Protection Agency

Editor's Note: The National Environmental Health Association (NEHA) strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, NEHA has partnered with the Office of Research and Development (ORD) within the U.S. Environmental Protection Agency (U.S. EPA) to publish two columns a year in the *Journal*. ORD is the scientific research arm of U.S. EPA. ORD conducts the research for U.S. EPA that provides the foundation for credible decision making to safeguard human health and ecosystems from environmental pollutants.

In these columns, authors from ORD will share insights and information about the research being conducted on pressing environmental health issues. The conclusions in these columns are those of the author(s) and do not necessarily represent the official position of U.S. EPA.

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Introduction

The power of open competition inspires innovative, transformative ideas that can help solve environmental issues and address community concerns. Challenge and prize competitions have rapidly gained support across federal agencies as a way to promote innovation and accelerate problem-solving, while delivering cost-effective, efficient solutions. By harnessing the ingenuity and creativity of the public, these incentive competitions can address pressing problems, stimulate innovative thinking, and encouraging community engagement in government activities. Challenge and prize competitions that are open to diverse audiences have a long history of use in both the public and private sectors. The information, solutions, or practices resulting from challenge and prize competitions have the

potential to be leveraged by other organizations or communities facing similar environmental or public health issues.

Since 2012, the Challenges and Prizes Program of the U.S. Environmental Protection Agency (U.S. EPA, 2023a) has hosted over 40 competitions that have used cash prizes and other incentives to reward problem-solvers. Over that time, U.S. EPA has awarded over \$1 million to prize winners and has collaborated with communities, federal agencies, and nonprofits to advance our core mission of protecting human health and the environment.

The following U.S. EPA challenges are just three examples of how challenge and prize competitions can provide a unique opportunity to tackle long-standing environmental and public health issues using the power of the crowd.

Wildland Fire Sensors Challenge

Wildland fires are a major source of air pollution that can irritate the eyes, nose, and throat; cause difficulty breathing; and worsen lung and heart disease. As the intensity and frequency of wildland fires continues to increase across the U.S., the need for improved air and smoke monitoring capabilities is critical, especially since most regulatory-grade smoke sensors are stationary and complicated to operate. In 2017, U.S. EPA partnered with five federal agencies to launch the Wildland Fire Sensors Challenge, which encouraged solvers to develop innovative, low-cost air sensors that were easy to deploy, usable for high concentration events, durable in difficult field conditions, and able to report data continuously and wirelessly to communities impacted by wildfire smoke (U.S. EPA, 2023b).

The winners of the challenge demonstrated incredible ingenuity using emerging technologies such as miniaturized direct-reading sensors, compact microprocessors, and wireless data communications to develop continuous, real-time smoke sensors that are accurate and portable. Overall, the Wildland Fire Sensors Challenge increased awareness of the importance of monitoring air quality during wildfires and served as a catalyst for advancing the next generation of sensor technology systems for wildland fire applications to protect public health. Even better, the winning sensors—Sensit and Thingy AQ (Figure 1)—are now commercially available and in use for wildland fire responses (Sensit Technologies, 2021; Thingy LLC, 2023).

Let's Talk About Heat Challenge

Extreme heat is an increasing problem for all parts of the U.S. Increasing temperatures

FIGURE 1

Second Place Winner of the Wildland Fire Sensors Challenge



The Thingy AQ from Thingy LLC in Bellevue, Washington, measures PM_{2.5}, carbon monoxide, carbon dioxide, and total volatile organic compounds. It is part of the Wildfire Smoke Air Monitoring Response Technology (WSMART) equipment loan program for state, tribal, and local governments from the U.S. Environmental Protection Agency.

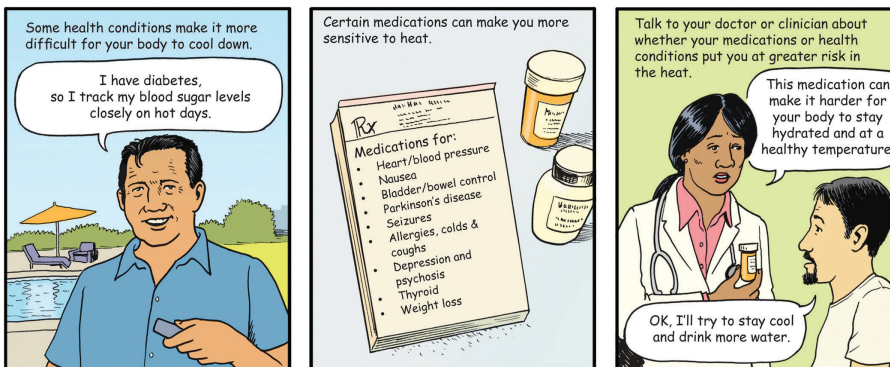
FIGURE 2

Map of Submission and Winner Locations for the Let's Talk About Heat Challenge



FIGURE 3

Example of the Comic Strip From One of the Winners of the Let's Talk About Heat Challenge



The comic strip was designed and published by Public Health—Seattle & King County in partnership with the Department of Environmental & Occupational Health Sciences at the University of Washington. The campaign was designed to reach people at high risk for heat illnesses and was offered in 13 different languages.

due to climate change are intensifying already higher temperatures in heat island areas where buildings, roads, and other infrastructure absorb and re-emit the sun's heat more than natural landscapes. Communities need help developing clear messages about the risks of extreme heat, how to stay safe, and how to build cooler communities for the long-term.

To address this need, U.S. EPA and its cosponsors launched the Let's Talk About

Heat Challenge to identify innovative and effective communication strategies that inform people of the risks of extreme heat and offer ways to keep people safe (U.S. EPA, 2022a). Target audiences for these messages included farm workers, children, construction workers, unsheltered neighbors, people living in neighborhoods with higher incidences of heat-related illnesses, and people with existing health disparities.

The challenge received 97 submissions from 31 different states, demonstrating a nationwide interest in the topic (Figure 2). Overall, 10 winners were publicly announced at a national webinar in August 2022 in the middle of heat season. The winners of the challenge all had memorable and effective strategies in place or in development that can now be shared with other communities across the country. For example, Public Health—Seattle & King County partnered with the Department of Environmental & Occupational Health Sciences at the University of Washington to design and publish "Stay Safe in the Heat" comic strips to reach people at high risk for heat illnesses in 13 different languages (Figure 3).

Now that the challenge is complete, U.S. EPA plans to work with some of the winners to collaboratively evaluate the effectiveness of different heat risk messages and outreach methods. This study could be used to develop a framework for evaluating heat risk messaging for other communities that are trying to manage the impacts of extreme heat.

Environmental Justice Video Challenge for Students

Many communities face greater environmental exposures and public health risks due to a history of inequitable environmental policies and lack of access to the decision-making process.

U.S. EPA defines environmental justice (EJ) as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (U.S. EPA, 2022b). U.S. EPA and cosponsors launched the two-phase EJ Video Challenge for Students to enhance the capacity of communities to address local environmental and public health inequities (U.S. EPA, 2023c).

In the first challenge phase, students created videos to identify and characterize an EJ issue(s) in a select community using data and publicly available tools. The winners of Phase 1 (Figure 4; U.S. EPA, 2022c) helped U.S. EPA and our partners have a better understanding of some of the EJ challenges facing vulnerable communities and how data and publicly available tools—including tools developed by U.S. EPA such as EnviroAtlas (www.epa.gov/enviroatlas), CompTox Chemicals Dashboard (www.epa.gov/chemical-research/comptox-chemicals-dashboard), EJScreen (www.epa.gov/ejscreen), and the National Stormwater Calculator (www.epa.gov/water-research/national-stormwater-calculator)—can be used to identify and characterize EJ issues. Students enhanced their knowledge and experience working with local organizations and helped communities identify EJ issues of importance.

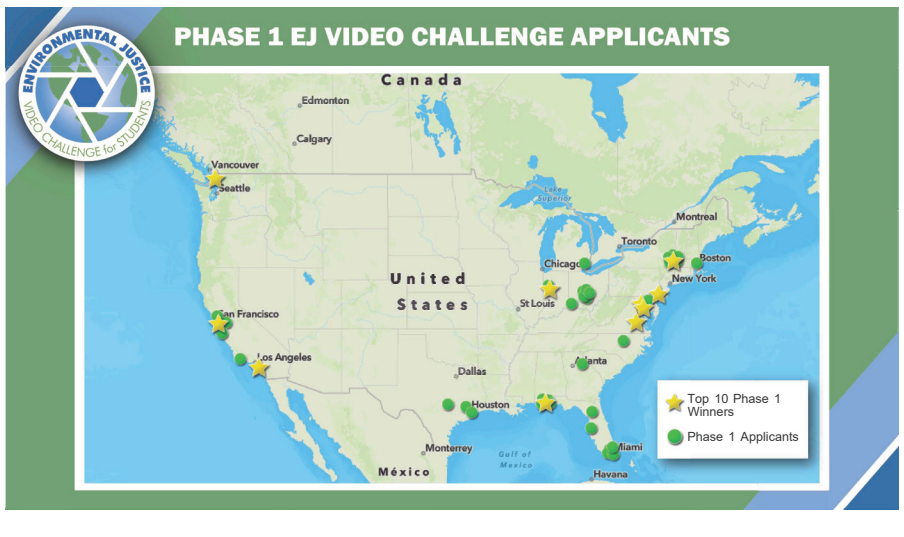
Phase 2 of the challenge focuses on enhancing the capacity of communities to address the EJ issues identified in Phase 1. To achieve this goal, students are working collaboratively with community-based organizations to develop a proposed strategy for community capacity building that demonstrates effective community engagement to address the previously identified EJ issues. The winners of Phase 2 are expected to be announced in spring 2023, with the prize money going to the students and partnering community organizations.

Onward and Upward

As the federal prize competition landscape grows, U.S. EPA will continue to use competitions and open-source innovations to fill priority gaps and increase the scale in which environmental issues are addressed. Local environmental health practitioners may find opportunities through these competitions to partner with their communities and other organizations to address their most important environmental health challenges.

FIGURE 4

Map of Phase 1 Applicant and Winner Locations of the Environmental Justice (EJ) Video Challenge for Students



We encourage potential solvers who want to help address nationwide problems to learn more and get involved. Inviting the public to participate in scientific and technical explorations allows agencies and organizations to reach a multitude of problem-solvers with diverse backgrounds, skills, and perspectives who can bring new solutions to the table and inspire people into action. 🌸

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