

Problem Statement: Environmental Communication & Engagement Best Practices

This problem statement includes the identification of messaging and communication methods using currently available community engagement, social media applications and other technologies to communicate with and engage permitted businesses and Arizona residents to take actions to protect public health and the environment and increase compliance with environmental regulations. Based on the research:

- Identify the environmental messages that have the most impact.
- Prepare a list of the available applications that are most effective in reaching diverse audiences including those of different cultures.

Background:

The mission of the Arizona Department of Environmental Quality (ADEQ) is to protect and enhance public health and the environment in our state, and our core functions include compliance management and outreach for air, water, and land. Our goal is to not only improve compliance rates, but also encourage the regulated community and the public to embrace approaches that improve the quality of Arizona's unique environment.

Historically, ADEQ has relied on communicating regulations, requirements and resources, through mailed letters, information shared by inspectors during the inspection process and posting information on its website. Since 2020, ADEQ has been communicating more through emails, often attaching letters, and conducting online meetings with regulated facilities, and we have had positive responses about this approach.

As ADEQ's regulated community continues to become more technologically advanced, their preferred methods of learning and communication have evolved. As the science about environmental impacts advances, we also want to identify effective ways to communicate technical information in a manner that empowers people to make informed decisions about managing their environmental exposures.

Problem Identification:

ADEQ has a wide variety of audiences from highly knowledgeable and regulated facilities to residents who just want to know their drinking water is safe and how their actions can help preserve Arizona's unique environment. The agency currently has no best practices to help guide the programs in communicating their messages to the right people.

Opportunity:

ADEQ is currently forming the Office of Intergovernmental and Community Engagement. This office will be a hub that provides guidance on engagement best practices and training and coaching to staff throughout the agency to ensure we meet our goals of improving facility compliance rates and encouraging people's commitment to enhance their quality of life and the environment in Arizona.

ADEQ programs are currently piloting and/or researching the following:

- SmartComment for centralized submission of and responses to public comments.
- ESRI hubs, story maps and other engagement tools that centralize data and information, including interactive maps, and provide ways to share information and receive feedback.

Mission Impact:

Results of this research project will be used to develop messaging and an application toolbox that can be used to provide more effective communication and engagement with both regulated facilities and the public, achieve higher compliance rates and promote targeted action to ensure protection of public health and the environment.

ENHANCING ADEQ'S COMMUNICATION AND ENGAGEMENT PRACTICES

Lead Principal Investigator and Team:

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Proposal Summary and Benefits to Arizona Residents:

Arizonans treasure our state's unique environment and its essential role in sustaining well-being and economic vitality today and for future generations. Arizona Department of Environmental Quality (ADEQ) administers the state's environmental laws and delegated federal programs to prevent air, water, and land pollution and ensure cleanup. ADEQ's mission is to protect and enhance Arizona's public health and environment through consistent, science-based environmental regulation; and clear, equitable engagement and communication; with integrity, respect, and the highest standards of effectiveness and efficiency. This proposal focuses on enhancing ADEQ's communication and engagement to achieve the highest standards of effectiveness and efficiency.

What messages are effective for increasing compliance and commitment? How do we design communication and messages that are engaging, appealing and persuasive? How do we best engage stakeholders, especially those not tuning into traditional information channels or regularly interacting with the government? In partnership with ADEQ, this project will conduct impact assessments of existing digital tools; ethnographic work, including community interviews; lab experiments using eye tracking; and a megastudy to identify the most impactful messages and modes for communicating with and engaging Arizona residents and businesses to take actions to protect the environment and increase compliance with environmental regulations. We will also propose a communication blueprint to help ADEQ strategize how to provide continuous messaging to its stakeholders based on existing and emergent tools.

The project will delineate specific communication activities (platform, tools, and applications) and communication messages (visual design, digital data tools, and motivational appeals) that ADEQ can use to craft effective future environmental communication. Effective messaging can help ADEQ advance its mission and inspire other Arizona agencies and organizations within similar domains (e.g., county health departments, city water utility departments, etc.). We expect the results of this project to benefit Arizona even beyond the specific domain of environmental issues, as agencies working to facilitate and promote other kinds of public goods may find value in the best practices for effective communication and engagement derived from this project.

Proposal Description and Scope of Work:

Identifying what environmental approaches and messages are impactful is complex and multifaceted. We propose three broad themes (ADAP), each entailing a series of questions:

- (1) **Applications:** What platforms, tools, and touchpoints effectively reach key stakeholders? How do we reach people who might not tune into traditional communication channels? What digital and analog tools are currently used, and how impactful are they?
- (2) **Data and Aesthetic:** How do we best communicate environmental data? How do we visualize data to make it appealing for Arizona residents and businesses to engage? How do Arizona residents experience digital data tools and environmental messages?
- (3) **Psychology:** What motivates Arizona residents and businesses to comply with environmental regulations? What motivational appeals can create a commitment to enhance and protect the environment?

Despite the ambitious nature of the ADAP framework, our multidisciplinary team of experts is ideally positioned to meet it (see below for team expertise). The three themes are organized as modules and operationalized in a way that considers ADEQ’s contextual needs. The modules are connected, and they will be examined jointly and simultaneously. Because the best way to comprehend how Arizonans and businesses interact with ADEQ’s environmental messages and communication is by observing, interacting with, and analyzing the people we wish to reach and influence, modules share two fundamental principles: co-creation and research-through-design. As a result, each module and its data-gathering procedures are based on the reasoning that we must first understand how people have experienced and responded to ADEQ’s current communication initiatives. We can then use this information to design and prototype new ways of delivering environmental information and data, test their real-world impact, and refine these new tools for continuous improvement. Below, we outline each of the three modules of the ADAP framework before detailing the specific deliverables we expect this project will bring to ADEQ.

Module 1 – Applications: This module identifies the most effective means for reaching ADEQ’s key stakeholders. Arizona residents comprise a diverse audience, representing various cultural, economic, and technological contexts. Because of this diversity, we need to consider different communication tools and how we can integrate them into a toolbox that ADEQ can use to tailor the content and the channels of future communication efforts. We will engage key stakeholders through learning, building, and testing cycles and use a participatory process to help ensure we collect inputs inclusively and comprehensively. Specifically, this module will focus on “understanding audiences” and “assessing tools,” both of which contribute, together with modules 2 and 3, to a “Communication Toolbox” ADEQ can use to enhance the effectiveness of its communication practices.

Understanding Audiences – to determine effective forms of communication, we will identify and map ADEQ’s stakeholders. This includes who the agency is trying to reach and how these stakeholders interact with different media. Working with ADEQ stakeholders, we seek to answer questions such as, “Which groups are ADEQ seeking to engage? How do different stakeholders engage with environmental messages? Who is missing from existing ways of communicating *and why?*” To address these questions, we will start from existing data gathered by ADEQ and conduct ethnographic fieldwork to understand the contexts shaping stakeholders’ *attitudes* and *behaviors*. We will ensure sites for fieldwork represent the spectrum of audiences in Arizona.

Assessing Tools – to identify possible modes of communication, we will create a catalog of existing communication tools, platforms, and applications. Our review will include analog and digital tools, including ones currently used by ADEQ (MyCommunity) and ones beyond those already used by ADEQ (e.g., the Arizona Water Blueprint Map). As part of this process, we will continue to develop criteria for assessing the tools’ effectiveness in reaching diverse audiences. To do so, we will create a “scorecard” and use it to benchmark the advantages and disadvantages of each tool or

platform. The scorecard can help identify the most effective forms of communication and provide ADEQ with a central mechanism for evaluating quantitative and qualitative metrics of various communication tools. To further ensure the effectiveness of discrete tools, we will use a co-design process for prototyping analog and digital tools and testing these prototypes against user needs.

Module 2 – Data and Aesthetic: This module examines how to visualize environmental data and information to enhance stakeholders’ understanding of environmental quality issues and promote targeted action to protect the environment. We will test various visualizations with audiences using eye-tracking technologies. These technologies measure how Arizona residents and businesses interact with data presented to them on a screen, how they read print documents, and how they view public presentations. Existing studies have used similar approaches to strengthen community engagement (Asikin-Garmager et al., 2022; Curry et al., 2018), and we anticipate that eye tracking will provide a unique glimpse into how stakeholders perceive, interact with, and use visualizations designed to share data and information about environmental quality.

Eye tracking is a well-established methodology used extensively to examine how individuals read text, view visualizations, and interact with consumer products and spaces. Commercial eye trackers work by shining an invisible infrared (IR) light into a viewer’s eyes while viewing and then measuring the angle and intensity of the reflection of this IR light off either the cornea or lens. The amount of reflection is then used to calculate where a viewer is looking on a given viewing plane. Specifically, eye trackers can identify precisely where and for how long viewers “fixate” with their eyes. A fixation is where eye movements stop processing information, and saccades occur in-between a set of fixations. Fixations can thus be examined over time to deduce how long viewers might process given pieces of information and where they looked before and after a fixation (e.g., viewing patterns).

We will use this technique to identify gaps between the visual data used to communicate environmental quality information and the audiences’ needs. We will collect pre-and post-interaction data about what Arizona residents know about specific topics and how they use the data to make decisions. We will then use the eye-tracking technology to understand where, for how long, and in what order audiences focus their gaze when interacting with different visuals and versions of existing and in-development environmental quality tools. We will run experiments that compare differently visualized versions of the same data to measure potential differences in viewing patterns and participant comprehension. This research will be invaluable in assessing and optimizing the translation of information between different stakeholder groups and provides critical insights into how data on environmental quality issues can be disseminated in impactful ways through digital tools and visual design.

Module 3 – Psychology: This module identifies the psychological levers that ADEQ can use to increase compliance and create a greater commitment among Arizona residents and businesses to enhance and protect the environment. We rely on a novel approach to test, experimentally, a series of appeals rooted in motivation, identity, norms, beliefs, and emotions through a so-called “megastudy.” Megastudies can improve our understanding of Arizona residents’ and businesses’ attitudes and actions by testing many different interventions (appeals) simultaneously among the same population (Milkman et al. 2021). We can directly compare and identify the impacts of specific psychological appeals embedded in the same message by fielding one massive field experiment rather than several smaller, disjointed ones.

We will use a dual strategy to decide which psychological appeals (interventions) to test. First, we will consult existing research, especially studies on environmental or climate-oriented behaviors.

Work on the frontiers of these areas emphasizes the potential for norm-based appeals such as “dynamic social norms” and “identity-based norms.” (Vlasceanu et al., 2023). Dynamic social norms encapsulate expectations “about how other people’s behavior and attitudes are changing over time.” (Sparkman and Walton 2017). In contrast, identity-based norms emphasize expectations about how people or businesses in the same social group behave (Fielding and Hornsey 2016). In addition to these and other psychological levers suggested in the existing scholarship, we will utilize our ethnographic fieldwork, including interviews and observation studies, to gain deeper insights into *when* and *why* Arizona residents and businesses have complied with environmental regulations in the past or decided to engage in pro-environmental behaviors voluntarily. This strategy follows our general principle of co-creation. It acknowledges that the most relevant insights and materials for creating effective communication are discovered in partnership with the people we wish to influence.

The megastudy builds on the knowledge and insights gained through modules 1 and 2. It holds the potential to identify the impact of specific messaging, considering both elements of psychology and visual design (cf. module 2). Importantly, because the megastudy is massive in the number of people it includes, it also enables us to explore *the extent to which* different psychological levers are impactful among different communities or specific subpopulations. We expect to field 15 or more interventions as part of the megastudy.

Deliverable: Developing a Toolbox – the main deliverable of this project will be a “communication toolbox” that ADEQ can use to enhance its communication and engagement practices. The toolbox will be based on the key findings from all three modules. Based on the scorecard and the impact assessments conducted as part of module 1, we will identify and include a short list of the most effective applications and tools for communicating data on environmental quality issues. To help validate the relevance and feasibility of this aspect of the toolbox, we will provide a blueprint for how ADEQ might integrate the different tools as part of future efforts to expand the agency’s portfolio of digital data tools. Based on modules 2 and 3, the toolbox will include visual designs and visualization templates for effective environmental data communication and messaging templates based on effective psychological appeals to pro-environmental behaviors. ADEQ can use these templates to craft the contents of future information campaigns and data dissemination efforts. Finally, the toolbox will include a pathway proposal for how ADEQ could deliver communication and interact with the public based on all three components, including how the agency may use applications and messages for effective environmental communication in different scenarios and among different stakeholder groups.

References: [1] Asikin-Garmager, A., Dowd, P., George, S., & Afifi, R. A. (2022). Integrating user experience evaluation in the development of a web-based Community Engagement Toolkit. *Evaluation and program planning*, 91, 102048. <https://doi.org/10.1016/j.evalprogplan.2022.102048>. [2] Curry, E., S. Hasan, C. Kouroupetroglou, W. Fabritius, U. ul Hassan and W. Derguech, "Internet of Things Enhanced User Experience for Smart Water and Energy Management," in *IEEE Internet Computing*, vol. 22, no. 1, pp. 18-28, Jan./Feb. 2018, doi: 10.1109/MIC.2018.011581514. [3] Fielding, K. S., & Hornsey, M. J. (2016). A social identity analysis of climate change and environmental attitudes and behaviors: Insights and opportunities. *Frontiers in psychology*, 7, 121. [4] Milkman, K. L., Gromet, D., Ho, H., Kay, J. S., Lee, T. W., Pandiloski, P., ... & Duckworth, A. L. (2021). Megastudies improve the impact of applied behavioural science. *Nature*, 600(7889), 478-483. [5] Sparkman, G., and Walton, G. M. (2017). Dynamic norms promote sustainable behavior, even if it is counternormative. *Psychol. Sci.* 28, 1663–1674. doi: 10.1177/0956797617719950 [6] Vlasceanu, M, Doell, K., Van Bavel, J. J. nd. International Collaboration to Understand Climate Action: Comparing Interventions Targeting Collective Action Against Climate Change. <https://manylabsclimate.wordpress.com>.

Goals and Timeline:

Performance Period	Goals
Year 1	<ul style="list-style-type: none"> Review and Mapping of Stakeholders Begin Review and Impact Assessments of Existing Tools Begin Ethnographic Field Work, Including Interviews
Year 2	<ul style="list-style-type: none"> Complete Impact Assessments of Existing Tools Complete Ethnographic Field Work, Including Interviews Conduct Lab and Lab-in-Field Experiments Using EyeTrackers
Year 3	<ul style="list-style-type: none"> Implement MegaStudy Field Experiment Creation of ADAP Communication Toolbox Dissemination of Findings and Best Practices for ADEQ

Team Expertise and Project Feasibility: Our interdisciplinary team is uniquely positioned to conduct this project based on the team members’ complementary expertise in service design, visual design, and behavioral science. Team members represent deep knowledge of the methodologies required to uncover the multifaceted ADAP communication framework. The team also has extensive knowledge of Arizona’s environmental area, including current and emergent digital data tools.

Jensen (PI) is a behavioral scientist and experimentalist with expertise in effective communication.

Molina is an expert on equity, representation, and public service provision in historically underrepresented communities, and **Roseland** lectures internationally and advises communities and governments on sustainable development policy and planning. **Mejía** is an expert in co-design, service design, and design for change. **Whitcomb** is an expert in design-driven innovation. **Craig**

leads ASU’s Impact Water and created Arizona Water Blueprint, an interactive tool providing information to empower inclusive and informed decision-making, and has previously worked at ADEQ, ADWR, and WIFA. **Navarro** is an expert on data visualization and translating complex data into accessible, actionable information. **Lambrech** specializes in bridging communication between experts and public audiences, and **Lauer’s** expertise includes user experience and data visualization design and evaluation using eye-tracking technologies.

Three-Year Budget Overview (* budget spreadsheet attached)

Salaries & Wages	Faculty Summer Salary,	\$367,701
	Postdocs,	\$
	Grad Students	\$552,397
	Undergrad Students and	\$
	Program Coordinator – max half time	
Employee Related Expenses (ERE)		\$139,642
Equipment		\$70,000
In-State Travel		\$35,000
Partner awards (ASU, NAU, or UA)		\$
Supplies & Materials		\$6,000
Other Costs	Includes tuition remission costs of 189,115	\$337,115
Total Three Year Cost		\$1,507,855