

# Report on the NOAA Office of Education Environmental Literacy Program Community Resilience Education Theory of Change



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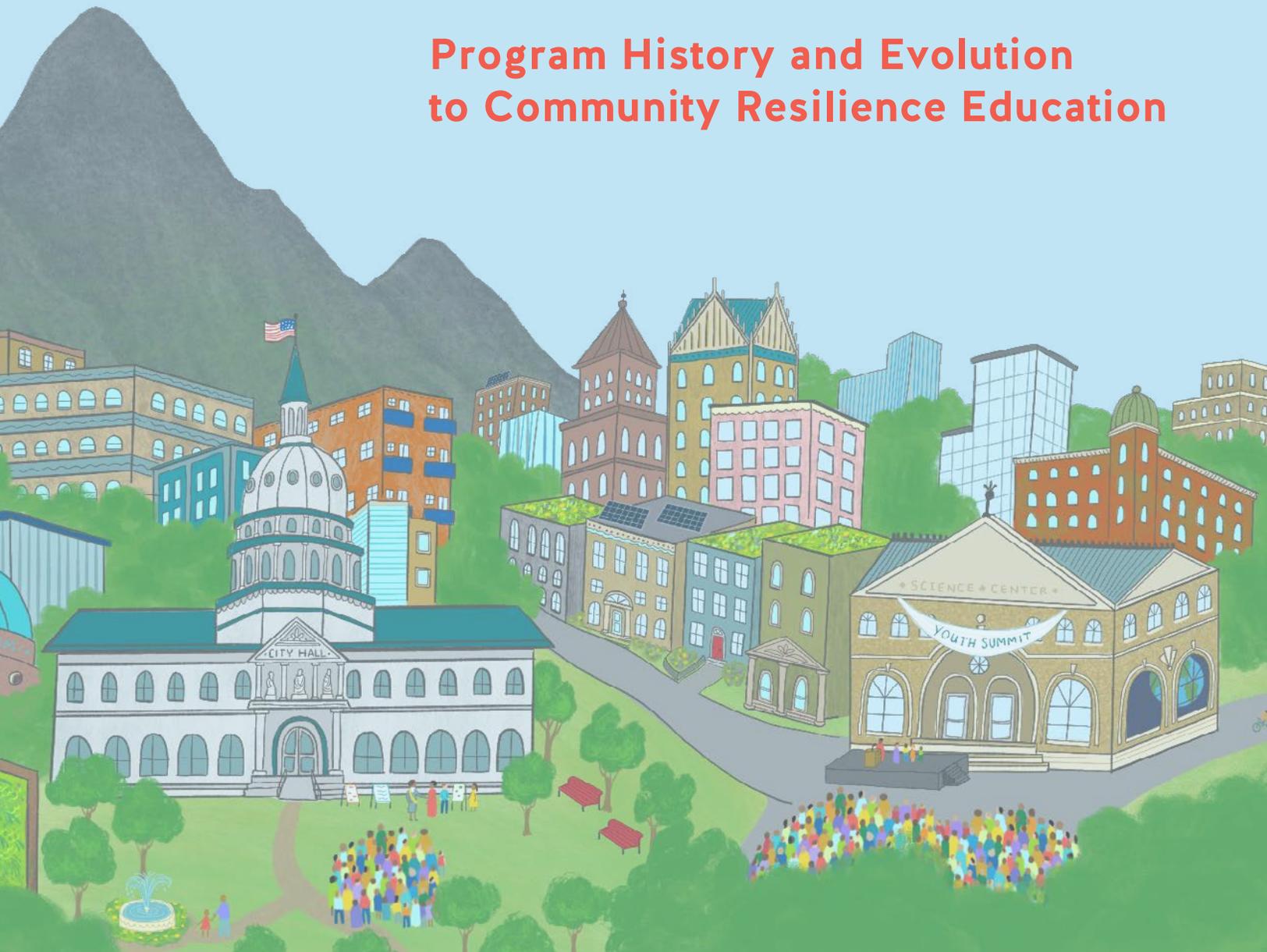
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# SECTION I

Program History and Evolution  
to Community Resilience Education



# SECTION I

## Program History and Evolution to Community Resilience Education

### Introduction

NOAA's Environmental Literacy Program (ELP) supports projects that both inspire and educate people to use Earth system science to increase ecosystem stewardship and resilience to extreme weather, climate change, and other environmental hazards (NOAA Education Strategic Plan, 2015–2035). Since the ELP's inception in 2005, grants offered through this program have supported both formal (K–12) and informal education initiatives that serve NOAA's mission of science, service, and stewardship. As outlined in NOAA's 2015–2035 Education Strategic Plan, “[f]or society to become more resilient, individuals should have the ability to understand scientific processes, consider uncertainty, and reason about the ways that human and natural systems interact. Therefore, it is not enough for NOAA to research Earth systems; NOAA must also empower the Nation to use this information to support healthy ecosystems, communities, and economies.” This reasoning lays the foundation for the critical role that education plays to achieve NOAA's mission.

The ELP has developed this Community Resilience Education Theory of Change to communicate the overarching philosophy guiding its grants program. It can also be used to inform project-level logic models, ensuring that a project's activities, outcomes, and goals are aligned with the ELP outcomes and goals articulated in this theory of change. Theories of change, much like logic models, are tools for planning, implementation, and evaluation of an initiative. They are broad in scope and are typically focused at the program level rather than on the individual project level. The United Kingdom Climate Impacts Programme's report “Theory of Change approach to climate change adaptation programming” is a helpful guide on this topic, and was used in the development of the ELP's theory of change. This report describes a theory of change in this way:

[Theory of change] approaches articulate an ultimate ‘big picture’ outcome, and then ‘backwards map’ the steps needed to achieve it. In other words, the stakeholders begin with defining the long-term goal, and work backwards in time up to the present, systematically laying out each step along a ‘causal pathway.’ For each step in the sequence, stakeholders outline clear indicators, thresholds, and assumptions. The end result is usually a diagram (‘change map’), accompanied by a narrative. Theory of change is also an iterative process; in other words, the strategy would be reviewed regularly and modified to reflect emerging conditions and new knowledge (Bours, McGinn, and Pringle 2014, 2).

The UKCIP guidance was used with one exception: in lieu of articulating indicators and thresholds, this theory of change articulates different levels of outcomes.

Additionally, as part of the development of the theory of change, a definition for community resilience education has been created and is provided later in this report.

## The Need for a Theory of Change

This theory of change demonstrates the ways in which the ELP fills a gap in resilience-building approaches and the audiences engaged by those approaches. NOAA's other resilience investments are focused on creating and promoting the use of science-based information and training for adults to apply that information within the context of their professions. While building the capacity of adults to use this information in a professional context is essential, so is equipping community members with the environmental literacy necessary to make informed decisions about the place-based challenges they face *outside of a professional context*. When community members engage in informed decision making, the efforts of resilience practitioners and local or state officials engaged in building community resilience are further supported. Finally, NOAA recognizes the importance of program evaluation and monitoring, and wanted to create a mechanism for tracking progress toward the ELP goal.

The ELP's aim in creating this theory of change is to outline the conceptual framework for the ways in which community resilience education can lead to increased community engagement and civic action, ultimately leading to a healthier, more resilient, and equitable society. This theory of change will serve a suite of purposes:

1. To provide a visual representation of the overarching philosophy that guides the current focus of the ELP grants program, informing program evaluation and future funding announcements. The theory of change is a tool to communicate the program's purpose, audiences, and activities, as well as the assumptions, intended outcomes, and ultimate end goal of ELP investments.
2. To offer current and future ELP grantees a resource to understand how their local efforts contribute to a broader, national effort to increase resilience to extreme weather, climate change, and other environmental hazards.
3. To aggregate effective approaches and outcomes identified by grantees.
4. To articulate the value of education in community, city, state, and national efforts to build community resilience to extreme weather, climate change, and other environmental hazards.
5. To serve as a model for how environmental literacy contributes to resilience that others working in the field of community resilience might use.

The intended audiences for this theory of change are NOAA colleagues; grantees; grantee partners; applicants; education professionals; resilience practitioners; and individuals from other local, state, and federal government agencies, environmental non-governmental organizations, and community, corporate, and private foundations.

Numerous sources were consulted in the development of this theory of change. The community resilience education projects funded by the ELP served as the primary basis for the theory of change. Relevant theories of change from other programs were consulted, including the American Association for the Advancement of Science Theory of Change for Public Engagement with Science (American Association for the Advancement of Science | Center for Public Engagement with Science & Technology 2016) and the aforementioned UKCIP Theory of Change approach to climate adaptation programming (Bours, McGinn, and Pringle 2014), as well as published literature in related fields. Input from NOAA staff and multiple stakeholders was incorporated throughout the development process. NOAA leadership and staff in NOAA's Office of Education, the NOAA Education Council, and NOAA experts in climate resilience and education provided feedback. Stakeholder input was also gathered at the 2019 NOAA ELP Community Resilience Education Grantee Workshop and the 2019 American Geophysical Union Fall Meeting.

## Shifting Focus from Climate Change Education to Community Resilience Education

NOAA's ELP began focusing on building the climate literacy of children, youth, and adults in 2009. At the same time, Congress asked the National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF) to support climate education. Recognizing that no single institution, education sector, or federal agency is sufficient to support the nation's climate education needs, NOAA, NASA, and NSF formed the Tri-Agency Climate Education (TrACE) Collaborative and coordinated more than \$110M of their investments in approximately 125 climate change education projects.

### This collaboration resulted in:

- An expanded research base on best practices in climate change education and communication and a common logic model;
- An active learning community focused on developing, implementing, and evaluating climate change education activities and programs;
- Infrastructure supporting networks of scientists, educators and others from academia, government, zoos and aquariums, and museums, who are involved in improving climate literacy among a diverse range of audiences; and
- Activities and products for use in climate change education and communication<sup>1</sup>.

Between 2009 and 2014, when the TrACE Collaboration was most active, there was an emerging recognition from within the TrACE Collaboration community, as well as the wider climate literacy community<sup>2</sup>, that increasing awareness of climate change and understanding of its causes was not sufficient to motivate audiences to take action to mitigate and adapt to climate impacts. Project evaluations indicated that even highly engaging science education projects that successfully built deep knowledge of the causes of climate change did not result in behavioral changes. Participants in these projects often expressed an interest in taking action, but they needed guidance on how to do so beyond household-level changes in behavior. The Ocean Project found similar results in studies of visitors to aquariums, and identified how youth can be powerful agents of change in their communities by engaging their peers and adults (The Ocean Project 2009; The Ocean Project 2011, 4). Additionally, the Yale Program on Climate Change Communication found that, while a majority of Americans believed climate change is happening, only a minority believed it would affect their lives directly (Yale Program on Climate Change Communication 2019).

By 2015, it had become clear that different approaches were needed to engage the public in stewardship and building resilience to environmental hazards at the community level. As a result, the focus of the ELP shifted from funding primarily climate literacy projects to funding K–12 and informal education projects focused on building community resilience to extreme weather, climate change, and other environmental hazards. These new approaches are solutions-oriented, locally focused, and engage, educate, and empower participants to take action individually and collectively. The first competition supporting this new program focus elicited a greater response than any previous ELP grant competition<sup>3</sup>.

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<sup>1</sup> Learn more about these activities and products and the projects that created them in the TrACE Catalog at [cleanet.org/trace/index.html](https://cleanet.org/trace/index.html).

<sup>2</sup> See the Climate Literacy and Energy Awareness Network at [cleanet.org](https://cleanet.org).

<sup>3</sup> These 22 projects came from a pool of 540 applications submitted through 3 separate competitions held between 2015 and 2018.

From 2015 to 2019, the ELP funded 22 community resilience education projects across the United States, its territories, and U.S.-based tribal communities. These projects serve rural, suburban, and urban audiences. The goal of these investments is to build environmental literacy of children, youth, and adults so they are knowledgeable of the ways in which their community can become more resilient to extreme weather, climate change, and other environmental hazards, and become involved in achieving community resilience. Education in this context does not include training for professionals working in the field of resilience, but it does include lifelong education that occurs within the formal (grades K–12) system and outside of it. There is no single ideal age audience to engage. Rather the audiences engaged will vary by community and the issue(s) being faced.

All ELP-funded projects focus on the most pertinent current and future environmental hazards of a particular place (or places), use local resilience plans<sup>4</sup>, and support local and state government efforts to build resilience. They create new partnerships between education institutions and local and state government offices charged with resilience planning, and they also may involve non-governmental and community-based organizations working in communities. To develop an understanding of scientific concepts, and the scientific process among participants, projects use NOAA's resilience assets and other scientific tools, such as the U.S. Climate Resilience Toolkit. Beyond natural science information, projects also incorporate social, cultural, historical, and economic factors as they develop participants' capacity to reason about the ways human and natural systems interact. They also engage participants in active and social learning to explore the impacts of extreme weather and climate change, as well as the inherent trade-offs associated with the different ways for addressing those impacts. Finally, these projects emphasize exploring and implementing community-scale solutions.



<sup>4</sup> For the purposes of this theory of change, resilience plans may include climate action plans, climate adaptation plans, hazard mitigation plans, sustainability plans, climate resilience plans, among others.

## Defining Resilience

The ELP acknowledges that the concept of resilience has been defined, researched, and debated across many academic disciplines, and has grown increasingly popular in recent years in research and policy discourse around disaster preparedness and climate action planning (Dubois and Krasny 2016; Meerow, Newell, and Stults 2016). This rise in popularity can be attributed to resilience theory being highly applicable to complex social-ecological systems, especially with regard to climate change. While many definitions of resilience exist, the definition put forth by the U.S. Global Change Research Program (USGCRP) is most in line with the goal of the ELP. They define resilience as: “a capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment” (2020). It is important to note that this definition of resilience, like many others, is limited to a concept of “bouncing back” to a previous state that may be fundamentally unstable and unjust. In the theory of change that follows, this limitation has been attempted to be addressed by articulating an **end goal** that encompasses “bouncing forward”, that is, transforming to a more equitable and sustainable future state.

**Theory of Change End Goal:** Communities are resilient to current and future environmental hazards in that they have the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment. Environmental literacy—along with community health, civic engagement, social cohesion, and equity—enhance resilience. Stewardship of healthy ecosystems, a low-carbon economy, and climate-smart and inclusive decision making further reduce risks from current and future environmental hazards.

## Defining Community Resilience Education

As the ELP began funding projects focused on community resilience education, there was a realization that it was a nascent field that required different ways of planning and implementing programs. Community resilience education programs differ from other science or environmental education programs in that they have different objectives, novel methods, and rely heavily on strategic partnerships (e.g., local/state government agencies and community-based organizations). Recognizing the importance of peer-to-peer learning and sharing best practices in developing fields, the ELP formed a community of practice among the ELP community resilience education grantees, their partners, and other resilience programs at NOAA. Collaboration within this group allows for identification of unique aspects of community resilience education projects and advances the field more rapidly. The concept of **community resilience education** has emerged from what the ELP community of practice learned collectively and has formed the basis of this theory of change. A definition of education as it pertains to community resilience to extreme weather, climate change, and other environmental hazards has also been generated:

**Community resilience education:** Educational approaches that develop community-level environmental literacy to understand threats and implement solutions that build resilience to extreme weather, climate change, and other environmental hazards. Environmental literacy here includes the knowledge, skills, and confidence to: (1) reason about the ways that human and natural systems interact globally and locally, including the acknowledgement of disproportionately distributed vulnerabilities; (2) participate in civic processes; and (3) incorporate scientific information, cultural knowledge, and diverse community values when taking action to anticipate, prepare for, respond to, and recover from environmental hazards, including mitigating and adapting to climate change.



## The Entire Education Sector Has a Role to Play

The concepts described above represent a set of broad and holistic approaches in which many disciplines are engaged and educational activities span a person's lifetime. Education is the primary means for building environmental literacy (Roth 1992). Therefore, the entire education sector has a role to play in achieving environmental literacy (United Nations Educational, Scientific, and Cultural Organization 1977, 12; Roth 1992, 35). K–12 schools can help lay the foundation for students to engage on these topics. Educators can serve as youth mentors and become experts in engaging students in local resilience issues. In particular, environmental educators, often operating outside of the K–12 arena, are uniquely situated to engage multiple stakeholders to address environmental, social, and economic challenges, and to explicitly connect communities to processes that enhance well-being (NAAEE 2017, 11). Informal education institutions, such as science centers, aquariums, and non-profit environmental or educational organizations, are often cited as trusted sources of science and conservation information (Spitzer and Fraser 2020). As such, they may serve as resilience hubs for their community to learn about and become engaged in these topics over a lifetime of learning (Schubel et al. 2013; Hoffman 2020; Spitzer and Fraser 2020). Higher education can further strengthen the workforce pipeline to implement and respond to new policies and emerging practices to mitigate and adapt to extreme weather, climate change, and other environmental hazards. These institutions may also serve as research centers and translators of that research into practice. All of these educational institutions are well positioned to respond to the resilience needs of their local community, demonstrate effective resilience practices, and serve as important partners with local and state governments in achieving resilience.

