

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



National Oceanic and
Atmospheric Administration
U.S. Department of Commerce

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ACKNOWLEDGEMENTS

The authors would like to thank everyone who gave their time, attention, and expertise to reviewing and commenting on various iterations of the ELP Community Resilience Education Theory of Change and this report. In particular, input from the ELP Resilience Education Community of Practice and the NOAA Climate Program Office's Climate and Societal Interactions and Communication, Education, and Engagement Divisions was critical to shaping this theory of change. Finally, special thanks to Judy Braus, Executive Director of NAAEE, for providing a detailed review of the full report and authoring the foreword.

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Published in 2020

Suggested citation: Bey, G., C. McDougall, & S. Schoedinger. 2020. Report on the NOAA Office of Education Environmental Literacy Program Community Resilience Education Theory of Change. National Oceanic and Atmospheric Administration, Washington, DC. doi:10.25923/mh0g-5q69



Published by the NOAA Office of Education

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SECTION IV

The ELP Community Resilience Education Theory of Change



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The ELP Community Resilience Education Theory of Change

The remainder of this report presents the 2020 version of NOAA's ELP Community Resilience Education Theory of Change:

- Problem Statement
- NOAA's Interventions
- ELP's Interventions
- Causal Pathways⁶
 - ELP Project Interventions
 - Short-, Mid-, and Long-term Outcomes
 - ELP Outcome
- ELP Goal
- End Goal

Illustrated diagrams depicting the overall Pathway to Change (Figures 4a-4b) and each of the causal pathways (Figures 6-11) are included below along with the illustration of the ELP Vision of a Resilient Community representing the end goal (Figure 5). These diagrams include visual depictions of the outcomes that have been identified in each causal pathway. In total, more than 100 outcomes were identified across the six causal pathways and the Pathway to Change.

Text-based versions of the Pathway to Change and the six causal pathways are included in Appendix B.

⁶ The components that are consistent across all causal pathways include: the problem statement, NOAA's interventions, the ELP's interventions, the intermediate goal (i.e., the ELP goal), and the end goal. What is unique in each causal pathway are the ELP-funded project interventions, short-, mid-, and long-term outcomes, and the ELP outcome.



NOAA's Environmental Literacy Program
Community Resilience Education Theory of Change

PATHWAY TO CHANGE

LEGEND

- No order of occurrence
- Occurs first
- Occurs second

PROBLEM STATEMENT

- Climate change is an increasing threat and communities are not fully prepared;
- Some groups are more vulnerable than others;
- More policies and actions that promote preparation, adaptation, and greenhouse gas mitigation are needed; and
- Policies and actions need to be informed by, and reflect the values of, community members.

Therefore...

- Communities need the collective skills, knowledge, and confidence (i.e., environmental literacy) to participate in decision making that informs policies and practices; and
- Different education approaches are needed to build environmental literacy and encourage civic engagement around resilience.

NOAA's INTERVENTIONS

NOAA focuses on four long-term goals that make important contributions to resilient ecosystems, communities, and economies. These goals include: Climate Adaptation and Mitigation, Weather-Ready Nation, Healthy Oceans, Resilient Coastal Communities and Economies.

ELP's INTERVENTIONS

In response to the great need throughout the United States, NOAA's Environmental Literacy Program (ELP) supports the development and strengthening of resilient communities through competitive grants, in-kind support (including NOAA personnel and other scientific assets), and an ELP Community of Practice.

SHORT-TERM OUTCOMES



Children, youth, and adults learn about the most pertinent environmental hazards of the place where they live and potential solutions.



Community members are familiar with local and state resilience plans and can use science tools to make informed decisions.



Community resilience education grantees convene and share their findings.



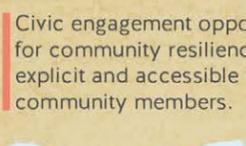
Community members develop an understanding of the history, culture, and lived experiences of diverse community members and the socio-economic factors of environmental hazards.



Community members have the knowledge, skills, and confidence to implement solutions to improve community resilience.



Education organizations create new partnerships with local and state government offices charged with resilience efforts.



Civic engagement opportunities for community resilience are explicit and accessible to community members.



Figure 2a: Pathway to Change



Figure 2b: Pathway to Change, continued

Problem Statement

Communities in the United States are facing challenges of not only recovering from on-going extreme weather events and other environmental hazards, but also preparing for a future of more frequent and damaging events caused by climate change (Lempert et al. 2018; NCEI 2020; Weather-ready Nation: NOAA's National Weather Service Strategic Plan 2019–2022). Climate change threatens human health and safety, ecosystem health, and social and economic well-being (USGCRP 2018). The geographic distribution of climate change impacts is uneven, and long-standing socioeconomic inequities heighten vulnerabilities for underserved groups. These threats become even greater with the increasing rates of greenhouse gas emissions (USGCRP 2018). The severity of future climate impacts will depend largely on national-scale and community-level actions taken to reduce greenhouse gas emissions and to adapt to the changes that will continue to occur.

To prepare for a future of increasing environmental hazards, communities need to implement more policies and practices that allow their members, regardless of socioeconomic status, to thrive and be resilient. These policies and practices should be informed by engaged community members and leaders who understand the causes of climate change and its impacts on their own lives now and in the future. Decisions about how to build more resilient and equitable communities should be based on scientific and other forms of knowledge (e.g., traditional and community knowledge), and represent the values of society. Such decisions can lead to more robust policies that will be better accepted if they truly reflect that society's values (Bozeman and Sarewitz 2011). Increasing environmental literacy among community members ensures that they comprehend the complex ways that human and natural systems interact, both globally and locally, and have the required skills, motivation, and confidence to participate in decisions that inform public policy.

Education is the primary means for building environmental literacy. Nevertheless, despite decades of efforts to educate about climate change, many community members do not prioritize climate change mitigation and adaptation solutions, and this is evident in the lack of political will and civic engagement on the issue (Leiserowitz 2019). While there are many reasons for this inaction that are not related to education, many educational approaches to date have been ineffective to inspire change because they have been too focused on the causes, the global scale of the problem, and impacts too distant from the learners (Flora et al. 2014; Leiserowitz et al. 2019). Further, as learners acquire more knowledge about climate change, they are often stifled by feelings of hopelessness and anxiety caused by comprehending the magnitude of the impacts and the complexity of the problem (Doherty and Clayton 2011; Ojala 2012; Clayton, Manning, and Hodge 2014). Together, these challenges call for different approaches to educating for community resilience to extreme weather, climate change, and other environmental hazards.

NOAA's Interventions

NOAA focuses on four long-term goals that make important contributions to resilient ecosystems, communities, and economies. These goals include: Climate Adaptation and Mitigation, Weather-ready Nation, Healthy Oceans, and Resilient Coastal Communities and Economies.

ELP's Interventions

In response to the great need throughout the United States, NOAA's Environmental Literacy Program (ELP) supports the development and strengthening of resilient communities through competitive grants, in-kind support (including NOAA personnel and other scientific assets) and an ELP Community of Practice.

List of Causal Pathways

Diagrams of the six causal pathways are included at the end of this section. These diagrams illustrate the project-level interventions; the short-, mid-, and long-term outcomes; and the ELP-level outcome achieved through each pathway.

- **Causal Pathway 1:** ELP Community of Practice Advances Effective Approaches
- **Causal Pathway 2:** Resilience Planning and Policies Integrate Education
- **Causal Pathway 3:** Active Learning Enables Community Engagement in Civic Processes
- **Causal Pathway 4:** Understanding Cultural and Historical Context of Place Builds Social Cohesion
- **Causal Pathway 5:** Student-driven Action Projects Implement Resilience Measures
- **Causal Pathway 6:** Youth Summits Empower Agents of Change

ELP Goal

Communities have sufficient collective environmental literacy to take actions that build resilience to extreme weather, climate change, and other environmental hazards in ways that contribute to community health, social cohesion, and socio-economic equity. These communities are composed of individuals who participate in formal and informal education experiences that develop their knowledge, skills, and confidence to:

- reason about the ways that human and natural systems interact globally and locally, including the acknowledgement of disproportionately distributed vulnerabilities;
- participate in civic processes; and
- incorporate scientific information, cultural knowledge, and diverse community values in decision making.

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.



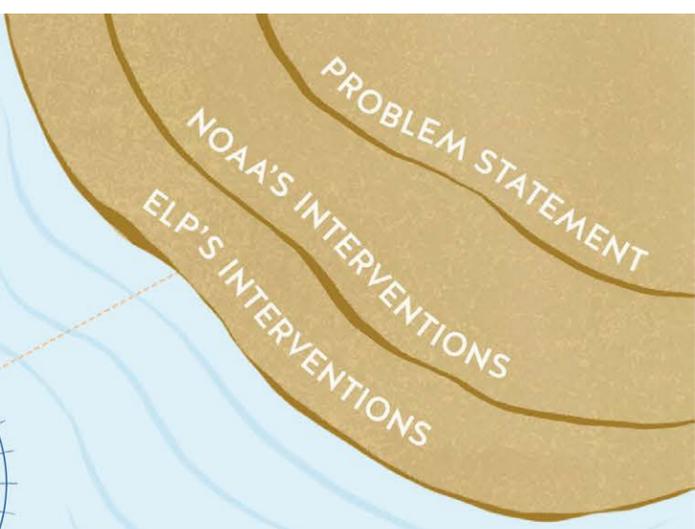
Figure 5: This illustration of the ELP Vision of a Resilient Community depicts several key aspects of the ELP Community Resilience Education Theory of Change. The ELP and end goals are brought to life through this portrayal of the future. The illustration also depicts all of the major institutional players, such as museums, aquariums, K-12 schools, universities and other educational and community-based organizations; the audiences; and the key approaches that have been identified as effective in using education to build community resilience. Children, youth, and adults are learning together and are directly engaged in activities that improve the resilience of their community.

CAUSAL PATHWAY 1

ELP Community of Practice Advances Effective Approaches

LEGEND

- No order of occurrence
- Occurs first
- Occurs second



ELP PROJECT INTERVENTIONS

ELP-funded projects collaborate as part of NOAA's ELP Community of Practice.

SHORT-TERM OUTCOMES

Effective approaches for community resilience education emerge and are shared.

Effective approaches are incorporated into currently funded projects and individual projects improve.

Collective needs are continually identified and assessed.

Members collaborate on projects.

Members support each other through ever-increasing strength of social bonds.

Members of the community of practice increase knowledge and skills related to community resilience education.

MID-TERM OUTCOMES

New funders sustain and scale up ELP-funded effective community resilience educational approaches.

A collective understanding of effective community resilience education is held among members.

Grantees collaborate to submit articles to peer-reviewed publications that describe effective approaches used across multiple projects.

Future projects are proposed to ELP funding solicitations that represent an amalgamation of effective approaches from other funded projects or formal collaborations among different grantees.



Grantees spur additional action in community resilience education by organizing efforts among institutions working in similar areas.

Priorities emerge from convenings of the community of practice that are incorporated into ELP's funding solicitations, addressed through learning opportunities, and considered for revisions to this theory of change.

Grantees organize sessions at conferences that they don't typically attend to increase the awareness of effective approaches and to reach new professional audiences.

LONG-TERM OUTCOMES

Resilience practitioners seek the expertise of members of the NOAA ELP Community of Practice.

Educators, not funded by ELP, are influenced by and use approaches identified by the NOAA ELP Community of Practice.

ELP OUTCOME

NOAA's ELP Community of Practice advances effective community resilience education both in individual projects and collectively through regular collaboration among grantees and sharing of findings within and beyond the community of practice.

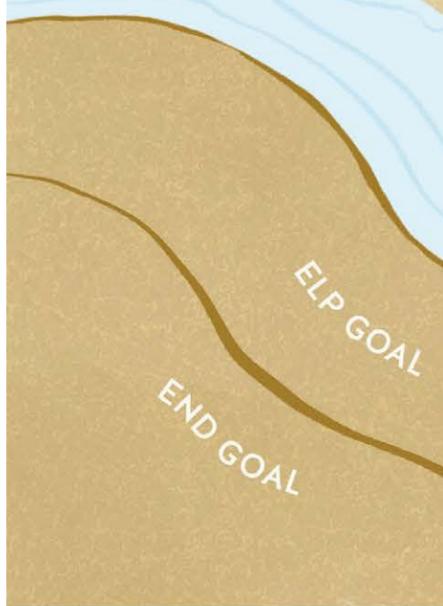


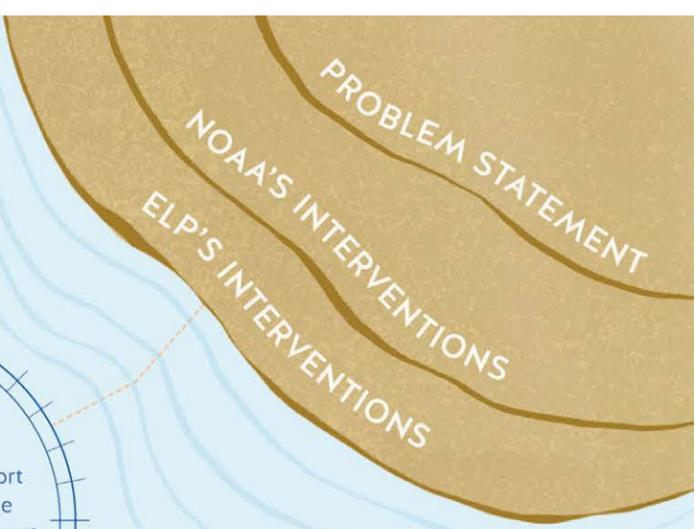
Figure 6: Causal Pathway 1: ELP Community of Practice Advances Effective Approaches

CAUSAL PATHWAY 2

Resilience Planning and Policies Integrate Education

LEGEND

- No order of occurrence
- Occurs first
- Occurs second



ELP PROJECT INTERVENTIONS

ELP-funded projects support local community resilience efforts by incorporating relevant resilience plans and partnering with resilience practitioners.

SHORT-TERM OUTCOMES

Community resilience education projects incorporate elements of resilience plans.

Resilience practitioners commit to being an advisor on, and/or participant in, community resilience education projects.

MID-TERM OUTCOMES

Resilience practitioners collaborate with members of the project team and provide on-going guidance on the implementation of the project.

Resilience practitioners support education as an essential process for achieving environmental literacy and helping to build community resilience.

LONG-TERM OUTCOMES

Resilience practitioners recognize and champion collective environmental literacy of children, youth, and adults as being necessary to achieve community resilience.

With community input, resilience practitioners integrate K-12 and informal education goals and approaches into their community's resilience plan.

ELP OUTCOME

Government policies and budgets provide resources (funding, personnel, etc.) to implement educational components of resilience efforts.

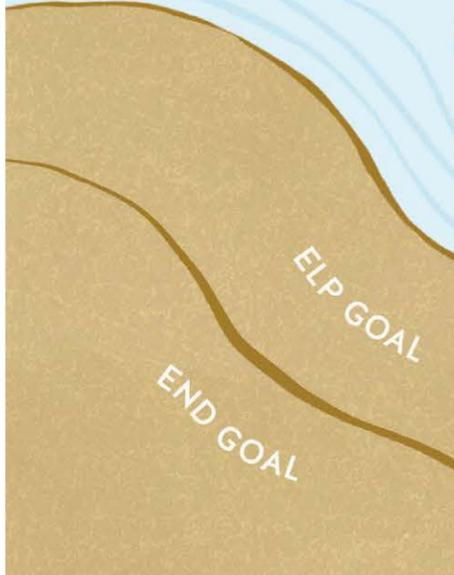


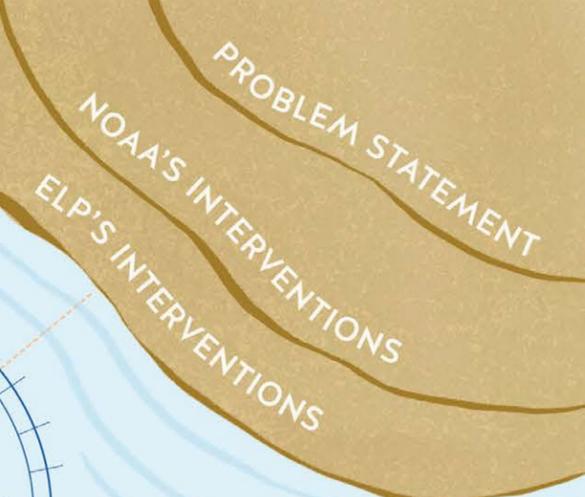
Figure 7: Causal Pathway 2: Resilience Planning and Policies Integrate Education

CAUSAL PATHWAY 3

Active Learning Enables Community Engagement in Civic Processes

LEGEND

- No order of occurrence
- Occurs first
- Occurs second



ELP PROJECT INTERVENTIONS

ELP-funded projects incorporate scientific and policy information into, and provide active learning (e.g., citizen science, deliberative forums, scenario-based interactives, and participatory decision making) opportunities to engage community members in civic processes.

SHORT-TERM OUTCOMES

Community members are knowledgeable about local resilience plans, interact with local resilience practitioners, and learn how to contribute to resilience planning.

Community members understand how to prepare better for extreme weather events.

Community members understand the disparate vulnerabilities existing in their community and the connection between community resilience and health.

Community-based organizations are engaged to enable members from historically underserved and marginalized groups within the community to have a voice in resilience planning and implementation.

Museums, aquariums, science centers and other informal education institutions have increased capacity to engage their local community and serve as hubs for resilience.

Community members work together to develop a collective understanding of local environmental hazards by identifying and defining the scope of the problem.

Community members develop an appreciation for trade-offs and uncertainty inherent in resilience planning.

Community members participate in data collection and perform investigations that inform resilience planning.

MID-TERM OUTCOMES

Museums, aquariums, science centers and other informal education institutions play leadership roles in enabling community-driven resilience.

Community members feel empowered to improve their community and that their voices are heard in resilience decisions.

Community members, including those from historically underserved and marginalized communities, have the knowledge, skills, and confidence (i.e., environmental literacy) to become civically engaged in resilience issues.

Community members work with resilience practitioners to identify their vulnerabilities to environmental hazards and co-produce preparedness, adaptation, and mitigation strategies to reduce those vulnerabilities.

Communities are more engaged with each other in building resilience and developing solutions that utilize scientific knowledge and reflect the values of society.

Diverse community members are civically engaged, make informed contributions to resilience decisions, and help practitioners implement equitable adaptation and mitigation strategies.

LONG-TERM OUTCOMES

ELP OUTCOME

Resilience policy decisions and implemented preparedness, adaptation, and mitigation strategies incorporate the values of society, improve community health, and bolster socioeconomic equity.



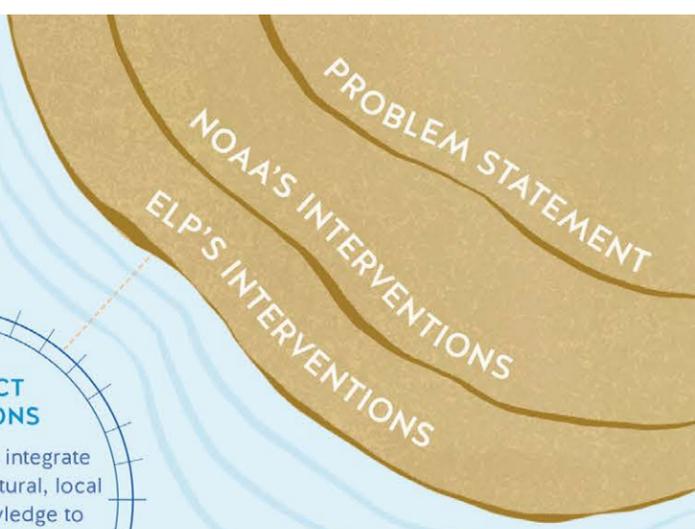
Figure 8: Causal Pathway 3: Active Learning Enables Community Engagement in Civic Processes

CAUSAL PATHWAY 4

Understanding Cultural and Historical Context of Place Builds Social Cohesion

LEGEND

- No order of occurrence
- Occurs first
- Occurs second



ELP PROJECT INTERVENTIONS

ELP-funded projects integrate relevant historical, cultural, local and traditional knowledge to build social cohesion among community members.

SHORT-TERM OUTCOMES



Community members (regardless of age) share their own lived experiences about local impacts of climate change and extreme weather, and learn about historical impacts, including impacts on socially important customs and institutions.

Children and youth learn from older adults within their community about local impacts of climate change and extreme weather events and use storytelling and other arts to share that knowledge with others.

Community members learn that there are different types of knowledge that are all important in building community resilience, in particular, indigenous knowledge and cultural practices.



Community members learn about the intersection of local social, economic, and political history as it relates to natural resources that are important to their community.



MID-TERM OUTCOMES



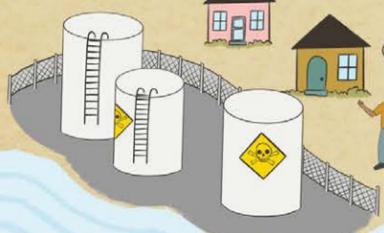
Community members are able to apply knowledge gained about traditional resilience practices and the impacts of climate change on socially important customs and institutions to make more culturally relevant decisions in resilience planning.



Community members develop empathy for others related to the impacts that climate change and extreme weather have had and will have on them.



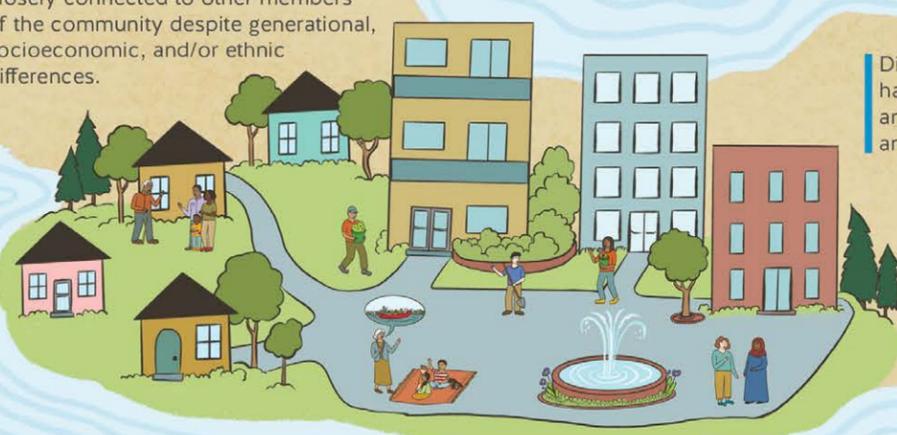
Community members develop an appreciation for different types of knowledge, and have a more expansive picture of their community and who it includes.



Community members develop an understanding of legacies of systemic and historical marginalization of certain groups, and the resulting unequal distribution of environmental impacts within a community.

LONG-TERM OUTCOMES

Community members feel more closely connected to other members of the community despite generational, socioeconomic, and/or ethnic differences.



Diverse community members have engaged in the development and support of resilience plans and practices.

Resilience plans and practices have integrated traditional and local knowledge and address equity issues.

ELP OUTCOME

Communities are more socially cohesive and implement resilience plans and practices that are more culturally relevant and represent diverse community values.

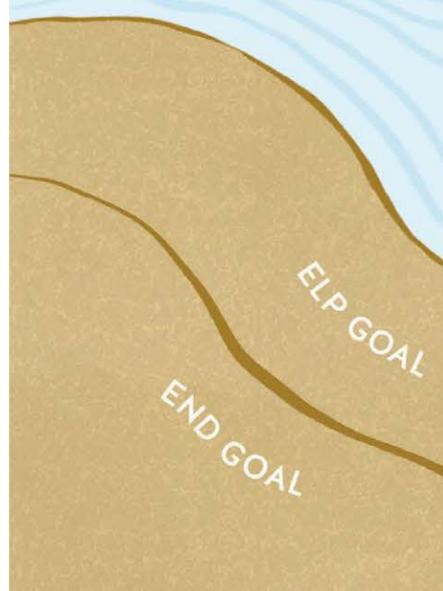


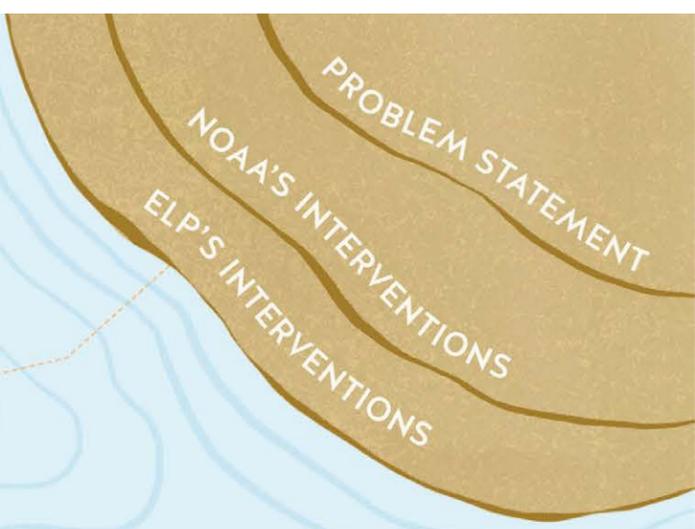
Figure 9: Causal Pathway 4: Understanding Cultural and Historical Context of Place Builds Social Cohesion

CAUSAL PATHWAY 5

Student-driven Action Projects Implement Resilience Measures

LEGEND

- No order of occurrence
- Occurs first
- Occurs second



ELP PROJECT INTERVENTIONS

ELP-funded projects support the creation and implementation of student-driven resilience action projects.

SHORT-TERM OUTCOMES



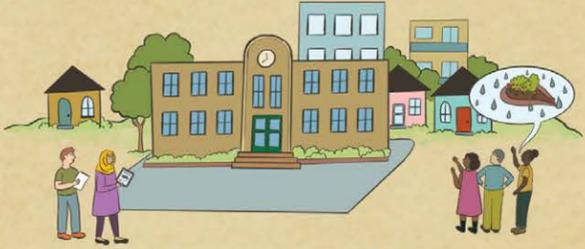
Educators understand how to use a curriculum and integrate relevant, credible data to guide their exploration of locally relevant environmental hazards.

Educators and students participate in active learning experiences (e.g., vulnerability assessments and citizen science) that help them identify and understand place-based environmental hazards and their impacts.



Educators and students identify resilience action projects that address the environmental hazard(s) of their concern.

Students follow a curriculum that guides their exploration of locally relevant environmental hazards including investigation of local and state resilience plans.



Educators and students apply knowledge and skills to create an implementation plan for their student-driven resilience action projects.



Local experts and community members are engaged and help with the development of student-driven resilience action projects.

Educators and students understand short-term preparedness actions and long-term solutions, and the trade-offs between different solutions, to the identified environmental hazards.

Educators and students understand uneven exposure to environmental hazards and unequal access to resources within their communities.

MID-TERM OUTCOMES



Educators and students work with local experts and community members to implement their action projects that aim to reduce vulnerabilities through short-term preparedness and long-term mitigation and adaptation strategies that may produce other co-benefits.

Vulnerability to the identified hazards is reduced in a community, particularly for the most vulnerable members of that community.



The action projects build confidence, skills and knowledge in the students and their educators that they apply in new situations.

LONG-TERM OUTCOMES

Students and educators are hopeful that their community will be more resilient.



Student-driven action projects improve community health.

Student-driven action projects and community engagement build more support for resilience plans and practices.

There is greater social cohesion within communities as a result of community members interacting with one another.

ELP OUTCOME

Educators and students have taken actions that reduce their community's vulnerability to the identified environmental hazard(s), making a positive impact on their community and providing a model for other members of their community to follow.



Figure 10: Causal Pathway 5: Student-Driven Action Projects Implement Resilience Measures

CAUSAL PATHWAY 6

Youth Summits Empower Agents of Change

LEGEND

- No order of occurrence
- Occurs first
- Occurs second

PROBLEM STATEMENT
NOAA'S INTERVENTIONS
ELP'S INTERVENTIONS

ELP PROJECT INTERVENTIONS
ELP-funded projects host youth summits and facilitate other youth leadership opportunities.

SHORT-TERM OUTCOMES



Youth represent the diversity of the communities in which they live.

Youth conduct vulnerability assessments of their community or school and participate in local hazard-resilience tours.



Youth and educators know how to access and apply relevant credible data related to local environmental hazards.

Youth gain an understanding of what is unique about their community and how their local economy and culture may be impacted by climate change.

Youth and associated educators prepare for, and participate in, youth summits and other leadership opportunities.

Youth learn about resilience plans that govern their community and are exposed to opportunities to partner with resilience practitioners and government officials.



Youth and educators learn from scientists and government officials about the science behind climate change and other environmental hazards facing their communities and what short-term preparations and long-term solutions can be taken to address risks and impacts.



Youth develop their understanding and communication skills and build confidence through presenting to one another, working in teams, and discussing among one another.

MID-TERM OUTCOMES



Educators of youth have increased knowledge and confidence to teach about climate change and other local environmental hazards.



Youth see themselves as climate leaders in their school and community.



Educators serve as mentors to youth pursuing community resilience leadership opportunities.

Youth, along with their educators, make informed decisions related to extreme weather preparedness and climate change adaptation and mitigation.



Youth, along with their educators, build social cohesion by connecting with peers who share similar concerns.



Youth, along with their educators, understand their community's disparate social and economic vulnerabilities to climate change and other environmental hazards, and can connect these vulnerabilities to systemic societal challenges.



Youth, along with their educators, communicate with their peers, families, and elected officials about community resilience issues.



Youth are viewed as partners in achieving resilience by community leaders.

ELP OUTCOME
Youth act as agents of change to increase resilience in their community.

LONG-TERM OUTCOMES

Youth leaders are hopeful about their community's future and understand the progress that can be made to address climate change and other environmental hazards.

Youth lead on climate and other environmental issues and champion equitable community resilience through their civic participation.

Youth leadership actions build more community support for resilience plans and practices.



Diverse youth perspectives are included in community resilience plans.

ELP GOAL
END GOAL



Figure 11: Causal Pathway 6: Youth Summits Empower Agents of Change