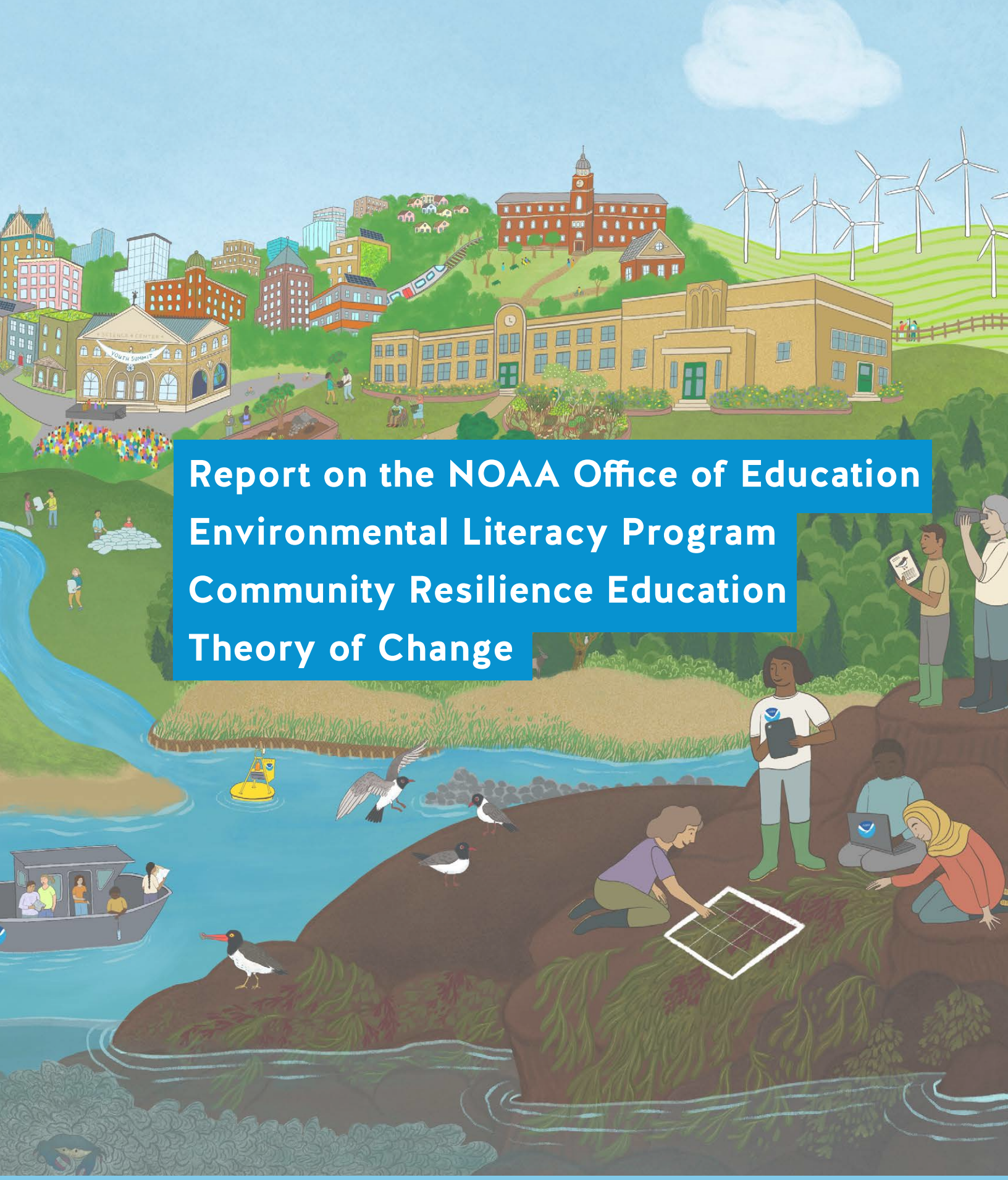

Report on the NOAA Office of Education Environmental Literacy Program Community Resilience Education Theory of Change

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

Authors: Genie Bey, Carrie McDougall, and Sarah Schoedinger | Version: July 2020

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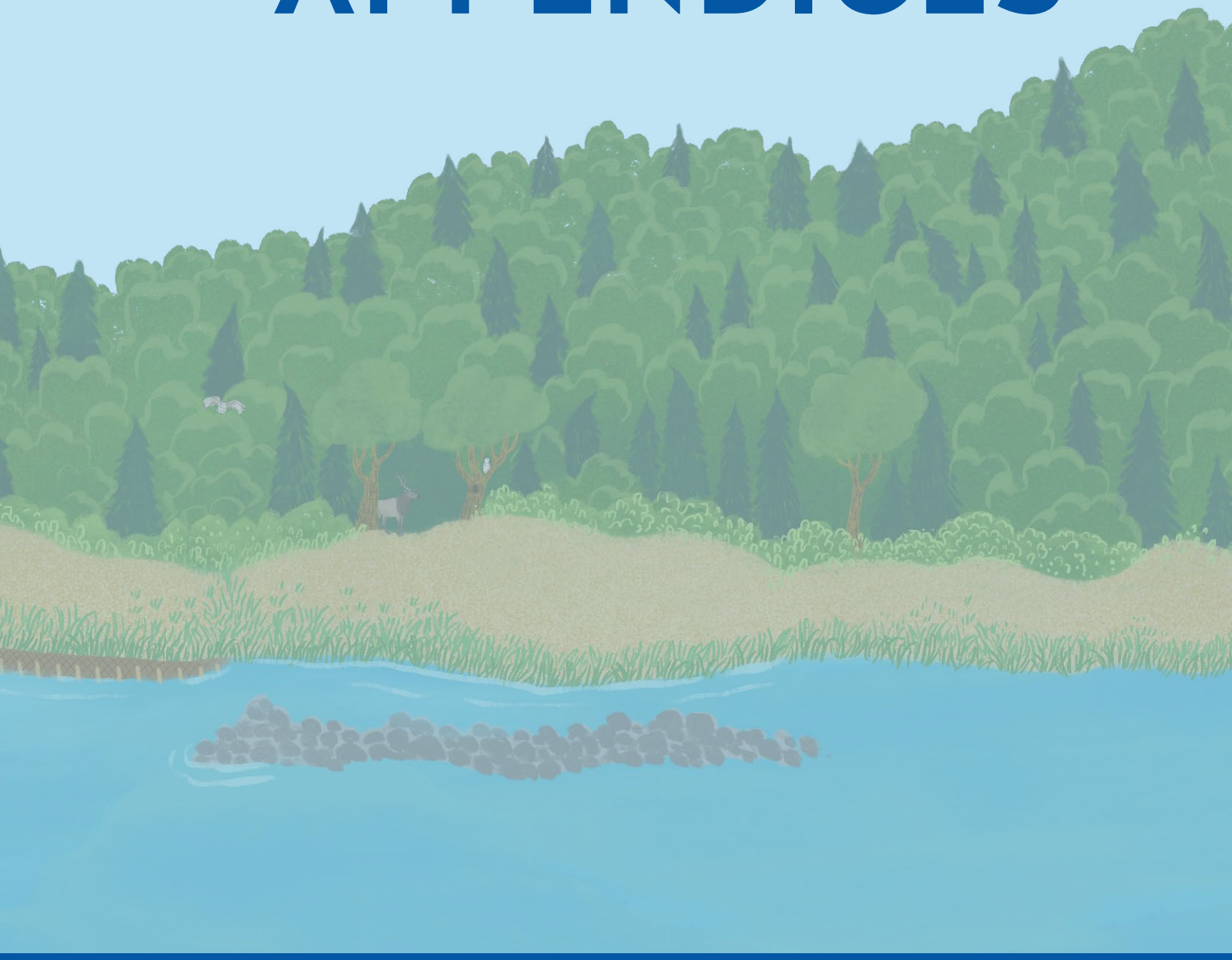
APPENDICES



APPENDIX A

Glossary

Active learning: A process whereby learners engage in activities, such as reading, writing, discussion, or problem solving that promote analysis, synthesis, and evaluation of information. Cooperative learning, problem-based learning, and the use of case methods and simulations are some approaches that promote active learning (Center for Research on Learning and Teaching 2020, crlt.umich.edu/tstrategies/tsal).

Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects (IPCC 2018, ipcc.ch/sr15/chapter/glossary).

Adaptive capacity: The ability of a person, asset, or system to adjust to a hazard, take advantage of new opportunities, or cope with change (U.S. Climate Resilience Toolkit 2020, toolkit.climate.gov/content/glossary).

Civic engagement: Working to make a difference in the civic life of our communities and developing the combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes (Ehrlich, 2000, vi, eric.ed.gov/?id=ED439659).

Citizen science: A form of open collaboration in which individuals or organizations participate voluntarily in the scientific process in various ways, including: (A) enabling the formulation of research questions; (B) creating and refining project design; (C) conducting scientific experiments; (D) collecting and analyzing data; (E) interpreting the results of data; (F) developing technologies and applications; (G) making discoveries; and (H) solving problems (from the Crowdsourcing and Citizen Science Act, a section of Public Law 114–329, congress.gov/114/plaws/publ329/PLAW-114publ329.pdf).

Community: A community can be defined as a system of systems, including natural, built, and social systems, as well as governmental and economic systems, that sustain and shape our lives (NAAEE 2017, 10, naaee.org/eepro/resources/community-engagement-guidelines).

Community-based organizations: Organizations that are driven by community residents in all aspects of their existence. This means that: the majority of the governing body and staff consists of local residents; the main operating offices are in the community; the priority issue areas are identified and defined by residents; solutions to address priority issues are developed with residents; and program design, implementation, and evaluation components have residents intimately involved in leadership positions (National Community–Based Organization Network 2011, sph.umich.edu/ncbon/whatis.html).

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.

Community science literacy: The capacity of a community to apply, do, and even guide science in ways that advance community priorities. It is a shared capacity, and it depends on and relates to the science learning of individuals as well as the connections, networks and agency that are distributed throughout the community (National Academies of Sciences, Engineering, and Medicine 2019, doi.org/10.17226/25183).

Climate change: Changes in average weather conditions that persist over multiple decades or longer. Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changing risk of certain types of severe weather events, and changes to other features of the climate system (USGCRP 2020, globalchange.gov/climate-change/glossary).

Climate justice: Ensuring that the people and communities who are least culpable in the warming of the planet, and most vulnerable to the impacts of climate change, do not suffer disproportionately as a result of historical injustice and disinvestment. Climate justice requires leaders to acknowledge that frontline communities are experts in creating solutions to protect and preserve our air, water, land, and communities, despite their historical exclusion from decision-making and from public resources and services. Climate justice requires leaders to provide public resources and services to frontline communities to engage and assist them in developing technologies, policies, professions, services, and projects for addressing the causes and impacts of climate change and healing from historical injustices (Adapted from The Greenlining Institute report Making Equity Real in Climate Adaptation and Community Resilience Policies and Programs 2019, greenlining.org/wp-content/uploads/2019/08/Making-Equity-Real-in-Climate-Adaption-and-Community-Resilience-Policies-and-Programs-A-Guidebook-1.pdf).

Climate literacy: An understanding of your influence on climate and climate's influence on you and society. A climate-literate person understands the essential principles of Earth's climate system, knows how to assess scientifically credible information about climate,

communicates about climate and climate change in a meaningful way, and is able to make informed and responsible decisions with regard to actions that may affect climate (USGCRP 2009, downloads.globalchange.gov/Literacy/climate_literacy_highres_english.pdf).

Education: The process by which individuals develop their knowledge, values, and skills. Education encompasses both teaching and learning (NOAA Education Strategic Plan 2015–2035, adapted from The Definitions Project, definitionsproject.com).

Environmental justice: 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. Fair treatment means that no one group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal environmental programs and policies. Meaningful involvement means that: (1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected (US Environmental Protection Agency 2020, epa.gov/environmentaljustice).

Environmental literacy: The possession of knowledge and understanding of a wide range of environmental concepts, problems, and issues; cognitive and affective dispositions toward the environment; cognitive skills and abilities; and appropriate behavioral strategies to make sound and effective decisions regarding the environment. It includes informed decision making both individually and collectively and a willingness to act on those decisions in personal and civic life to improve the well-being of other individuals, societies and the global environment (adapted from Hollweg et al. 2011, naaee.org/our-work/programs/environmental-literacy-framework).

Nominal environmental literacy indicates a person able to recognize many of the basic terms used in communicating about the environment and able to provide rough, if unsophisticated, working definitions of their meanings. Persons at the nominal level are developing an awareness and sensitivity towards the environment along with an attitude of respect for natural systems and concern for the nature and magnitude of human impacts on them. They also have a very rudimentary knowledge of how natural systems work and how human social systems interact with them.

Functional environmental literacy indicates a person with a broader knowledge and understanding of the nature of and interactions between human social systems and other natural systems. They are aware and concerned about the negative interactions between these systems in terms of at least one or more issues and have developed the skills to analyze, synthesize, and evaluate information about them using primary and secondary sources. They evaluate a selected problem/issue on the basis of sound evidence and personal values and ethics. They communicate their findings and feelings to others. On issues of particular concern to them, they evidence a personal investment and motivation to work toward remediation using their knowledge of basic strategies for initiating and implementing social or technological change.

Operational environmental literacy indicates a person who has moved beyond functional literacy in both the breadth and depth of understandings and skills who routinely evaluate the impacts and consequences of actions; gathering and synthesizing pertinent information, choosing among alternatives, and advocating action positions and taking actions that work to sustain or enhance a healthy environment. Such people demonstrate a strong, ongoing sense of investment in and responsibility for preventing or remediating environmental degradation both personally and collectively, and are likely to be acting at several levels from local to global in so doing. The characteristic habits of mind of the environmentally literate are well ingrained. They are routinely engaged in dealing with the world at large (Roth 1992, 26, files.eric.ed.gov/fulltext/ED348235.pdf).

Exposure: The presence of people, assets, and ecosystems in places where they could be adversely affected by hazards (U.S. Climate Resilience Toolkit 2020, toolkit.climate.gov/content/glossary).

Extreme weather: A weather event that is rare at a particular place and time of year, including, for example, heat waves, cold waves, heavy rains, periods of drought and flooding, and severe storms (USGCRP 2020, globalchange.gov/climate-change/glossary).

Frontline communities: Frontline communities are those that experience continuing injustice—including people of color, immigrants, people with lower incomes, those in rural areas, and indigenous people—due to a legacy of systemic, largely racialized, inequity that influences their living and working places, the quality of their air and water, and their economic opportunities (The Greenlining Institute report Making Equity Real in Climate Adaptation and Community Resilience Policies and Programs 2019, greenlining.org/wp-content/uploads/2019/08/Making-Equity-Real-in-Climate-Adaption-and-Community-Resilience-Policies-and-Programs-A-Guidebook-1.pdf).

Geographic literacy: The understanding of human and natural systems, geographic reasoning, and systematic decision-making (National Geographic Society 2020, nationalgeographic.org/media/what-is-geo-literacy).

Hazards: An event or condition that may cause injury, illness, or death to people or damage to assets (U.S. Climate Resilience Toolkit 2020, toolkit.climate.gov/content/glossary).

Impacts: Effects on natural and human systems that result from hazards. Evaluating potential impacts is a critical step in assessing vulnerability (U.S. Climate Resilience Toolkit 2020, toolkit.climate.gov/content/glossary).

Knowledge co-production: The collaborative process of bringing a plurality of knowledge sources and types together to address a defined problem and build an integrated or systems-oriented understanding of that problem (Armitage et al. 2011, doi.org/10.1016/j.gloenvcha.2011.04.006).

Logic model: A graphic depiction (road map) that presents the shared relationships among the resources, activities, outputs, outcomes, and impact for your program. It depicts the relationship between your program's activities and its intended effects (Centers for Disease Control and Prevention, Program Performance and Evaluation Office 2018, cdc.gov/eval/logicmodels/index.htm).

Mitigation: Measures to reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing carbon dioxide from the atmosphere (USGCRP 2020, globalchange.gov/climate-change/glossary).

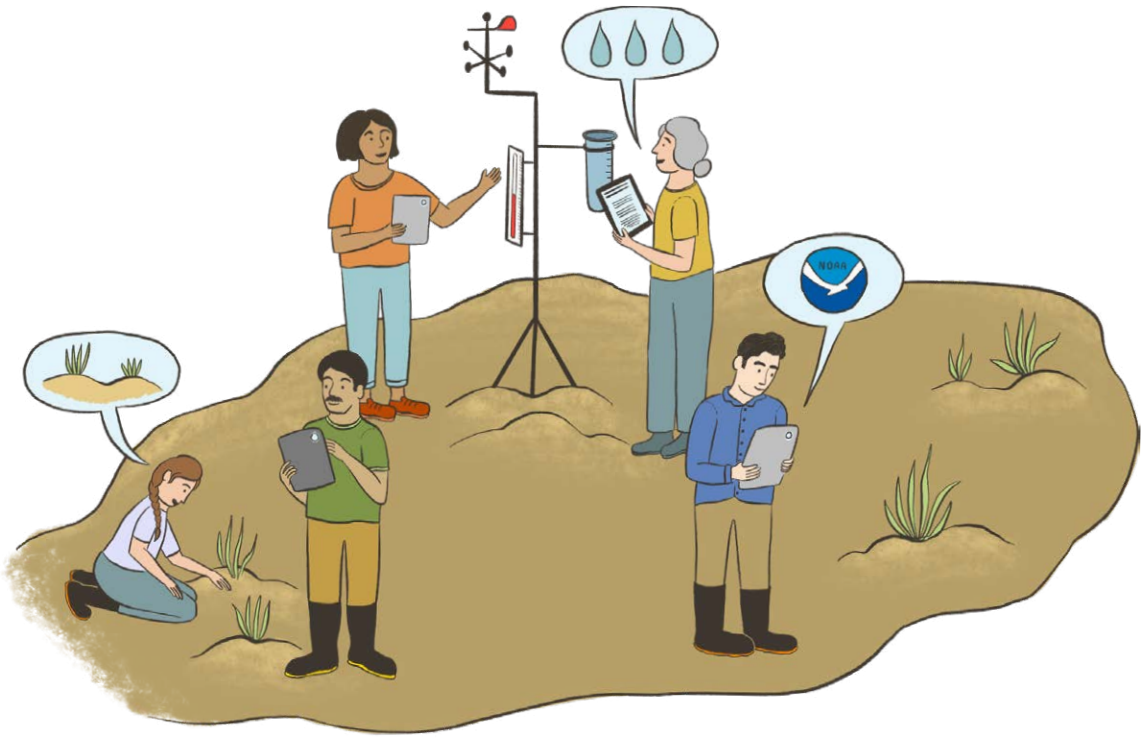
NOAA assets: Resources, services, or sites that are used to support NOAA's mission and to communicate NOAA research, data, information, and knowledge to the public. These include education materials and programs, datasets and visualizations, subject matter experts, facilities, and managed natural resource areas.

Resilience: 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 (USGCRP 2020, globalchange.gov/climate-change/glossary).

Resilience plans: 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.

Resilience practitioner: Professionals charged with producing and/or implementing resilience plans.

Risk: The potential for adverse consequences where something of value is at stake and where the occurrence and degree of an outcome is uncertain. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to such a hazard, on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Risk results from the interaction of vulnerability (of the affected system), its exposure over time (to the hazard), as well as the (climate-related) hazard and the likelihood of its occurrence (IPCC 2018, ipcc.ch/sr15/chapter/glossary).



Scientific literacy: The ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person, therefore, is willing to engage in reasoned discourse about science and technology which requires the competencies of:

- Explaining phenomena scientifically – Recognising, offering and evaluating explanations for a range of natural and technological phenomena.
- Evaluating and designing scientific enquiry – Describing and appraising scientific investigations and proposing ways of addressing questions scientifically.
- Interpreting data and evidence scientifically – Analysing and evaluating data, claims and arguments in a variety of representations and drawing appropriate scientific conclusions (OECD 2018, doi.org/10.1787/b25efab8-en).

Social capital: The social networks and connectivity among groups and individuals within a community. This includes levels of trust and reciprocity, political engagement, length of residence, volunteerism, religious affiliation, and community organizations and services. Also included is the feeling of belonging to and a sense of place about the community (NASEM 2019, 14, doi.org/10.17226/25383).

Social cohesion: Social cohesion refers to the extent to which groups and communities cooperate, communicate to foster understanding, participate in activities and organizations, and collaborate to respond to challenges (e.g., a natural disaster or disease outbreak) (NASEM 2014, 34, doi.org/10.17226/18831).

Social-ecological resilience: The capacity of a social-ecological system to continually change, adapt, or transform so as to maintain ongoing processes in response to gradual and small-scale change, or transform in the face of devastating change (Folke, Colding, and Berkes 2001, doi.org/10.1017/CBO9780511541957).

Social learning: Ongoing, adaptive process of knowledge creation that is scaled up from individuals through social interactions fostered by critical reflection and the synthesis of a variety of knowledge types, that result in changes in social structures (e.g., organizational mandates, policies, social norms) (Sharpe et al. 2019, 44, doi.org/10.13140/RG.2.2.31730.25285).

Theory of change: Approaches that 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, ukcip.ouce.ox.ac.uk/wp-content/PDFs/MandE-Guidance-Note3.pdf).

Uncertainty: An expression of the degree to which future climate is unknown. Uncertainty about the future climate arises from the complexity of the climate system and the ability of models to represent it, as well as the inability to predict the decisions that society will make. There is also uncertainty about how climate change, in combination with other stressors, will affect people and natural systems (USGCRP 2020, globalchange.gov/climate-change/glossary).

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC 2018, ipcc.ch/sr15/chapter/glossary).

Youth: Persons between the ages of 15 and 24 years old (United Nations 2020, un.org/en/sections/issues-depth/youth-0).

APPENDIX B

Full-Text Versions of the Pathway to Change and the Six Causal Pathways

PATHWAY TO CHANGE

PROBLEM STATEMENT[7]

- 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 develop an understanding of the history, culture, and lived

7 This version of the problem statement is an abstract of the full-text version provided in Section IV.

experiences of diverse community members and the socio-economic factors of environmental hazards.

- Civic engagement opportunities for community resilience are explicit and accessible to community members.
- Community members are familiar with local and state resilience plans and can use science tools to make informed decisions.
- Community members have the knowledge, skills, and confidence to implement solutions to improve community resilience[8].
- Community resilience education grantees convene and share their findings.
- Education organizations create new partnerships with local and state government offices charged with resilience efforts.

MID-TERM OUTCOMES

- Educational activities support local and state government resilience efforts[9].
- Resilience practitioners value and support education projects.
- Youth act as agents of change to increase resilience in their community.
- Student-driven, and educator supported, action projects improve community resilience.
- NOAA's ELP Community of Practice advances effective community resilience education.
- Diverse community members are civically engaged and make informed contributions to resilience decisions[10].
- Community members help practitioners implement equitable and culturally relevant preparedness, adaptation, and carbon mitigation actions.

LONG-TERM OUTCOMES

- Collective environmental literacy is built among children, youth, and adults within a community.
- Equity is central to community resilience education approaches.
- Social cohesion is increased, contributing to community resilience.
- Community resilience policies reflect the values of society.
- Government resilience policies and plans incorporate and provide support for community resilience education.
- Community members feel hopeful and are motivated to take action[11].
- Community members understand and act in support of local and state resilience efforts.
- Communities have greater adaptive capacity.

8 Within this level of outcomes, the first four outcomes occur before this one does.
9 This outcome is a precondition for the one that comes after it.
10 This outcome is a precondition for the one that comes after it.
11 This outcome is a precondition for the one right after it.

ELP OUTCOME = ELP GOAL[12]

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.

12 The program outcome for the ELP Pathway to Change is the ELP Goal of the Theory of Change.

CAUSAL PATHWAY 1: ELP COMMUNITY OF PRACTICE ADVANCES EFFECTIVE APPROACHES

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

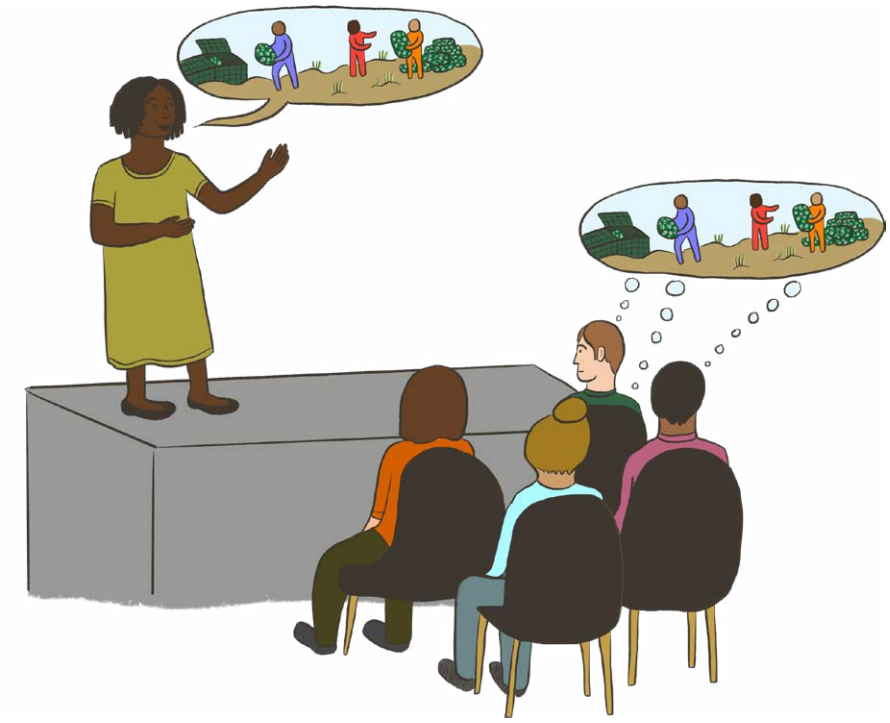
- Future projects are proposed to ELP funding solicitations that represent an amalgamation of effective approaches from other funded projects or formal collaborations among different grantees.
- Grantees spur additional action in community resilience education by organizing efforts among institutions working in similar areas.
- Grantees organize sessions at conferences that they don't typically attend to increase the awareness of effective approaches and to reach new professional audiences.
- Grantees collaborate to submit articles to peer-reviewed publications that describe effective approaches used across multiple projects.
- 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.
- 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.

LONG-TERM OUTCOMES

- Educators, not funded by ELP, are influenced by and use approaches identified by the NOAA ELP Community of Practice.
- Resilience practitioners seek the expertise of members of 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.



CAUSAL PATHWAY 2: RESILIENCE PLANNING AND POLICIES INTEGRATE EDUCATION

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.

CAUSAL PATHWAY 3: ACTIVE LEARNING ENABLES COMMUNITY ENGAGEMENT IN CIVIC PROCESSES

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

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.

LONG-TERM OUTCOMES

- 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.

ELP OUTCOME

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

CAUSAL PATHWAY 4: UNDERSTANDING CULTURAL AND HISTORICAL CONTEXT OF PLACE BUILDS SOCIAL COHESION

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

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

CAUSAL PATHWAY 5: STUDENT-DRIVEN ACTION PROJECTS IMPLEMENT RESILIENCE MEASURES

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.
- Students follow a curriculum that guides their exploration of locally relevant environmental hazards including investigation of local and state resilience plans.
- 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 understand shorter-term preparedness actions and longer-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.
- Educators and students identify resilience action projects that address the environmental hazard(s) of their concern[13].
- Educators and students apply knowledge and skills to create an implementation plan for their student-driven resilience action projects[14].
- Local experts and community members are engaged and help with the development of student-driven resilience action projects.

MID-TERM OUTCOME

- 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.

LONG-TERM OUTCOMES

- The action projects build confidence, skills and knowledge in the students and their educators that they apply in new situations.
- There is greater social cohesion within communities as a result of community members interacting with one another.

13 This outcome is predicated on at least one of the first four short-term outcomes being achieved.
14 This outcome is predicated on at least one of the first four short-term outcomes being achieved.

- Vulnerability to the identified hazards is reduced in a community, particularly for the most vulnerable members of that community.
- Student-driven action projects improve community health.
- Student-driven action projects and community engagement build more support for resilience plans and practices.
- Students and educators are hopeful that their community will be more resilient.

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.

CAUSAL PATHWAY 6: YOUTH SUMMITS EMPOWER AGENTS OF CHANGE

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 associated educators prepare for, and participate in, youth summits and other leadership opportunities.
- 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 and educators know how to access and apply relevant credible data related to local environmental hazards.
- Youth learn about resilience plans that govern their community and are exposed to opportunities to partner with resilience practitioners and government officials.
- Youth develop their understanding and communication skills and build confidence through presenting to one another, working in teams, and discussing among one another.
- Youth gain an understanding of what is unique about their community and how their local economy and culture may be impacted by climate change[15].

MID-TERM OUTCOMES[16]

- Educators of youth have increased knowledge and confidence to teach about climate change and other local environmental hazards.
- Educators serve as mentors to youth pursuing community resilience leadership opportunities.
- 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, make informed decisions related to extreme weather preparedness and climate change adaptation and mitigation.
- Youth see themselves as climate leaders in their school and community.
- Youth, along with their educators, build social cohesion by connecting with peers who share similar concerns.

15 This outcome occurs after the others above it, but there is no other order of occurrence among these short-term outcomes.

16 These mid-term outcomes occur in the order they are listed here. The first outcome in the list is a necessary precondition for the others at this level.

- 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.

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 OUTCOME

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

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