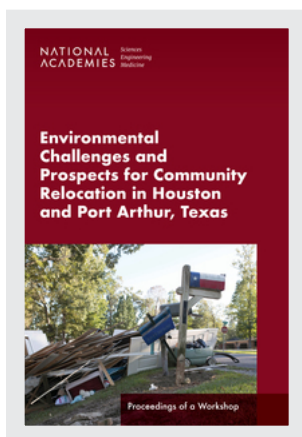


This PDF is available at <http://nap.nationalacademies.org/26701>



Environmental Challenges and Prospects for Community Relocation in Houston and Port Arthur, Texas: Proceedings of a Workshop (2022)

DETAILS

74 pages | 6 x 9 | PAPERBACK

ISBN 978-0-309-69317-2 | DOI 10.17226/26701

CONTRIBUTORS

Heather Kreidler, Rapporteur; Board on Environmental Change and Society; Division of Behavioral and Social Sciences and Education; National Academies of Sciences, Engineering, and Medicine

SUGGESTED CITATION

National Academies of Sciences, Engineering, and Medicine 2022. *Environmental Challenges and Prospects for Community Relocation in Houston and Port Arthur, Texas: Proceedings of a Workshop*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26701>.

BUY THIS BOOK

FIND RELATED TITLES

Visit the National Academies Press at nap.edu and login or register to get:

- Access to free PDF downloads of thousands of publications
- 10% off the price of print publications
- Email or social media notifications of new titles related to your interests
- Special offers and discounts



All downloadable National Academies titles are free to be used for personal and/or non-commercial academic use. Users may also freely post links to our titles on this website; non-commercial academic users are encouraged to link to the version on this website rather than distribute a downloaded PDF to ensure that all users are accessing the latest authoritative version of the work. All other uses require written permission. ([Request Permission](#))

This PDF is protected by copyright and owned by the National Academy of Sciences; unless otherwise indicated, the National Academy of Sciences retains copyright to all materials in this PDF with all rights reserved.

NATIONAL
ACADEMIES

Sciences
Engineering
Medicine

NATIONAL
ACADEMIES
PRESS
Washington, DC

Environmental Challenges and Prospects for Community Relocation in Houston and Port Arthur, Texas

Heather Kreidler, *Rapporteur*

Board on Environmental Change
and Society

Division of Behavioral and
Social Sciences and Education

PREPUBLICATION COPY—Uncorrected Proofs

Proceedings of a Workshop

Copyright National Academy of Sciences. All rights reserved.

THE NATIONAL ACADEMIES PRESS 500 Fifth Street, NW Washington, DC 20001

This activity was supported by the Gulf Research Program of the National Academies of Sciences, Engineering, and Medicine. Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of any organization or agency that provided support for the project.

International Standard Book Number-13: 978-0-309-XXXXX-X

International Standard Book Number-10: 0-309-XXXXX-X

Digital Object Identifier: <https://doi.org/10.17226/26701>

This publication is available from the National Academies Press, 500 Fifth Street, NW, Keck 360, Washington, DC 20001; (800) 624-6242 or (202) 334-3313; <http://www.nap.edu>.

Copyright 2022 by the National Academy of Sciences. National Academies of Sciences, Engineering, and Medicine and National Academies Press and the graphical logos for each are all trademarks of the National Academy of Sciences. All rights reserved.

Printed in the United States of America.

Suggested citation: National Academies of Sciences, Engineering, and Medicine. 2022. *Environmental Challenges and Prospects for Community Relocation in Houston and Port Arthur, Texas: Proceedings of a Workshop*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26701>.

The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The **National Academy of Engineering** was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. John L. Anderson is president.

The **National Academy of Medicine** (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the **National Academies of Sciences, Engineering, and Medicine** to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The National Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at **www.nationalacademies.org**.

Consensus Study Reports published by the National Academies of Sciences, Engineering, and Medicine document the evidence-based consensus on the study's statement of task by an authoring committee of experts. Reports typically include findings, conclusions, and recommendations based on information gathered by the committee and the committee's deliberations. Each report has been subjected to a rigorous and independent peer-review process and it represents the position of the National Academies on the statement of task.

Proceedings published by the National Academies of Sciences, Engineering, and Medicine chronicle the presentations and discussions at a workshop, symposium, or other event convened by the National Academies. The statements and opinions contained in proceedings are those of the participants and are not endorsed by other participants, the planning committee, or the National Academies.

Rapid Expert Consultations published by the National Academies of Sciences, Engineering, and Medicine are authored by subject-matter experts on narrowly focused topics that can be supported by a body of evidence. The discussions contained in rapid expert consultations are considered those of the authors and do not contain policy recommendations. Rapid expert consultations are reviewed by the institution before release.

For information about other products and activities of the National Academies, please visit www.nationalacademies.org/about/whatwedo.

**WORKSHOP PLANNING COMMITTEE ON MANAGED
RETREAT IN THE U.S. GULF COAST REGION**

- JANICE BARNES** (*Co-Chair*), Founding and Managing Partner, Climate Adaptation Partners
- TRACIE T. SEMPIER** (*Co-Chair*), Coastal Resilience Engagement Specialist, Mississippi–Alabama Sea Grant Consortium
- KAYODE O. ATOBA**, Associate Research Scientist, Institute for a Disaster Resilient Texas, Texas A&M University
- GARY S. BELKIN**, Visiting Scientist, Harvard University T.H. Chan School of Public Health, and Founder and President, Billion Minds Institute
- DEBRA M. BUTLER**, Mellon Foundation Curriculum Development Fellow, Mellon Foundation NAIS Fellow at Five Colleges, Inc.
- CRAIG E. COLTEN**, Professor Emeritus, Louisiana State University
- KATHERINE J. CURTIS**, Associate Director and Professor of Community and Environmental Sociology, Center for Demography and Ecology, University of Wisconsin–Madison
- HARRIET FESTING**, Co-Founder and Executive Director, Anthropocene Alliance
- LYNN R. GOLDMAN**, Michael and Lori Milken Dean and Professor of Environmental and Occupational Health, Milken Institute School of Public Health George Washington University
- E. BARRETT RISTROPH**, Owner, Ristroph Law, Planning, and Research
- CATHERINE L. ROSS**, Regents’ Professor and Harry West Professor of City and Regional Planning, and Director, Center for Quality Growth and Regional Development, Georgia Institute of Technology
- GAVIN P. SMITH**, Professor, Department of Landscape Architecture and Environmental Planning, North Carolina State University
- NATALIE L. SNIDER**, Associate Vice President for Climate Resilient Coasts and Watersheds, Environmental Defense Fund
- COURTNEY S. THOMAS TOBIN**, Assistant Professor in Community Health Sciences, Fielding School of Public Health, and Faculty Associate, Ralph J. Bunche Center for African American Studies, University of California, Los Angeles

Staff

- CHANDRA L. MIDDLETON**, Study Co-Director
- JOHN BEN SOILEAU**, Study Co-Director
- THOMAS F. THORNTON**, Board Director
- GRACE BETTS**, Research Associate
- SITARA RAHIAB**, Senior Program Assistant

BOARD ON ENVIRONMENTAL CHANGE AND SOCIETY

- KRISTIE L. EBI** (*Chair*), Professor, Rohm & Haas Endowed Professorship in Public Health Sciences, University of Washington, Seattle
- BILAL M. AYYUB**, Professor and Director, Center for Technology and Systems Management, Department of Civil and Environmental Engineering, University of Maryland
- LISA DILLING**, Professor, Department of Environmental Studies, Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder
- KENNETH GILLINGHAM**, Professor, Yale School of the Environment, Yale University
- LORI M. HUNTER**, Professor of Sociology and Director, Population Research Program, Institute of Behavioral Science, University of Colorado Boulder
- KATHARINE L. JACOBS**, Director, Center for Climate Adaptation Science and Solutions; Professor and Specialist, Department of Soil, Water and Environmental Science, University of Arizona
- STEPHEN H. LINDER**, Interim Chair, Department of Management, Policy and Community Health, Faculty Team, Health Policy, Quality Enhancement Plan, UTHSC, Co-Director, Community Engagement Core, Gulf Coast Center for Precision Environmental Health
- MICHAEL ANTHONY MENDEZ**, Assistant Professor, School of Social Ecology, Department of Urban Planning and Public Policy, University of California, Irvine
- ASEEM PRAKASH**, Professor, Department of Political Science, Walker Family Professor for the College of Arts and Sciences; Founding Director, Center for Environmental Politics, University of Washington, Seattle
- BENJAMIN KENNETH SOVACOOOL**, Professor of Earth and Environment, Boston University
- MICHAEL P. VANDENBERGH**, Professor and David Daniels Allen Distinguished Chair in Law, Vanderbilt University Law School
- CATHY L. WHITLOCK**, Professor of Earth Sciences, Montana State University
- THOMAS F. THORNTON**, Board Director

COMMITTEE ON POPULATION

ANNE R. PEBLEY (*Chair*), Research Professor, Fielding School of Public Health and California Center for Population Research, University of California Los Angeles

EMILY M. AGREE, Research Professor, Johns Hopkins University, and Associate Director, Hopkins Population Center

DEBORAH BALK, Professor of Public Affairs, School of Public and International Affairs, Baruch College

ANN K. BLANC, Vice President of Social and Behavioral Science Research, The Population Council

COURTNEY C. COILE, Professor of Economics, Wellesley College

SONALDE DESAI, Distinguished University Professor, University of Maryland

DANA A. GLEI, Senior Research Investigator, Georgetown University

ROBERT A. HUMMER, Howard W. Odum Distinguished Professor of Sociology and Fellow, Carolina Population Center, University of North Carolina at Chapel Hill

HEDWIG LEE, Professor of Sociology, Washington University in St. Louis

TREVON D. LOGAN, Hazel C. Youngberg Trustees Distinguished Professor of Economics and Associate Dean, College of Arts and Sciences, The Ohio State University

JENNIFER J. MANLY, Associate Professor of Neuropsychology, Gertrude H. Sergievsky Center and the Taub Institute for Research in Aging and Alzheimer's Disease, Columbia University

JENNA NOBLES, Professor of Sociology, University of Wisconsin-Madison

FERNANDO RIOSMENA, Associate Professor, Population Program and Geography Department, University of Colorado at Boulder

DAVID T. TAKEUCHI, Associate Dean for Faculty Excellence, School of Social Work, University of Washington

MALAY MAJMUNDAR, Director

PREPUBLICATION COPY—Uncorrected Proofs

Copyright National Academy of Sciences. All rights reserved.

Reviewers

This Proceedings of a Workshop was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published proceedings as sound as possible and to ensure that it meets the institutional standards for quality, objectivity, evidence, and responsiveness to the charge. The review comments and draft manuscript remain confidential to protect the integrity of the process.

We thank the following individuals for their review of this proceedings:

TIMOTHY FILBERT, National Academies of Sciences, Engineering, and Medicine

E. BARRETT RISTROPH, Ristroph Law, Planning, and Research

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the content of the proceedings nor did they see the final draft before its release. The review of this proceedings was overseen by Stephen H. Linder, University of Texas School of Public Health. He was responsible for making certain that an independent examination of this proceedings was carried out in accordance with standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the rapporteur and the National Academies.

PREPUBLICATION COPY—Uncorrected Proofs

Copyright National Academy of Sciences. All rights reserved.

Preface

Strategically moving communities and infrastructure—including homes and businesses—away from environmentally high-risk areas, such as vulnerable coastal regions, has been referred to as “managed retreat.”¹ Of all the ways humans respond to climate-related disasters, managed retreat has been one of the most controversial due to the difficulty inherent in identifying when, to where, by whom, and the processes by which such movement should take place.

The term managed retreat has long been problematic and the concept difficult to discuss. The phrase conjures disparate ideas: a well-organized top-down management strategy on the one hand and a desperate defeat by “retreating” communities, on the other. Communities considering relocation feel this dissonance, leading many to search for alternate ways of discussing the possibility, including not using the term “managed retreat” at all. Another difficulty in discussing managed retreat is the variability of its definition. In some contexts, it describes passive retreat measures, such as creating barriers to continued growth by changing zoning laws or providing disincentives.² In other cases, it describes active measures, such as moving physical structures.³ One result of these difficulties is that other solutions to mitigating climate impacts on residential areas—like erecting floodwalls or

¹Spidalieri, K., and Bennett, A. (n.d.). *Georgetown Climate Center's Managed Retreat Toolkit*. Available at: <https://www.georgetownclimate.org/adaptation/toolkits/managed-retreat-toolkit/introduction.html>

²Cheong, S.-M. (2010). Policy solutions in the U.S. *Climatic Change*, 106(1), 57–70

³Pinter, N. (2021). True stories of managed retreat from rising waters. *Issues in Science and Technology*, 37(4), 64–73.

raising structures—are considered and often implemented before discussing relocation as an adaptive strategy. Additionally, many communities located in areas requiring a retreat are of significant socio-economic disparities,⁴ raising questions of how the nation’s historical and ongoing social and economic inequities⁵ might be considered in the context of managed retreat.

Population growth, coupled with the rapid onset of climate change over the last century, means that a retreat could potentially involve coordinating the relocation of major cities, as well as smaller communities. In both cases, relocation takes enormous resources over the course of many years, making it an unenviable prospect for politicians and policymakers. However, given the increasing prevalence of climate-related disasters, the dynamics of considering managed retreat as an option for communities is a timely challenge. The drivers of climate displacement and relocation are well documented (e.g., floods). However, less understood are the financial, policy, and decision-making mechanisms that facilitate or occlude relocation, on the one hand, and the perspectives of frontline communities that must navigate these mechanisms when faced with the reality of relocation, on the other. Advancing this discussion by including the voices of communities faced with the difficult consideration of managed retreat as an adaptive strategy to coastal change may support equitable and effective decision making.

⁴Martinich, J., Neumann, J., Ludwig, L., and Jantarasami, L. (2013). Risks of sea level rise to disadvantaged communities in the United States. *Mitigation and Adaptation Strategies for Global Change*, 18(2), 169–185.

⁵Siders, A.R., and Ajibade, I. (2021). Introduction: Managed retreat and environmental justice in a changing climate. *Journal of Environmental Studies and Sciences*, 11(3), 287–293.

Contents

Acronyms and Abbreviations	xvii
1 Introduction and Background	1
PURPOSE OF THE WORKSHOP, 2	
ORGANIZATION OF THE WORKSHOP PROCEEDINGS, 4	
2 Part One: Buyouts and Other Forms of Strategic Relocation in Greater Houston, Texas	5
COMMUNITY TESTIMONIALS, 5	
DISCUSSION AND Q&A WITH COMMUNITY TESTIMONIAL PANELISTS, 9	
CHALLENGES, OPPORTUNITIES, AND LESSONS LEARNED FROM BUYOUT PROGRAMS AND HOUSTON AS A RECEIVING COMMUNITY, 12	
DISCUSSION AND Q&A WITH CHALLENGES, OPPORTUNITIES, AND LESSONS LEARNED FROM BUYOUT PROGRAMS AND HOUSTON AS A RECEIVING COMMUNITY PANELISTS, 16	
IMPLICATIONS OF INEQUITY FOR DISPLACEMENT, HEALTH, AND COMMUNITY WELLBEING, 18	
Q&A WITH COMMITTEE MEMBERS AND AUDIENCE, 25	
CLOSING REMARKS, 27	

3 Strategic Relocation and Environmental Perception: Community Perspectives from Port Arthur, Texas	29
THE PORT ARTHUR, TEXAS COMMUNITY, 30	
COMMUNITY PERSPECTIVE: UNMET NEEDS IN PORT ARTHUR, 31	
COMMUNITY PERSPECTIVE: REBUILDING, 32	
COMMUNITY PERSPECTIVE: INDUSTRY IMPACTS, 33	
COMMUNITY PERSPECTIVE: A “GUMBO” OF PROBLEMS, 34	
COMMUNITY PERSPECTIVE: PROBLEMS TO ADDRESS, 34	
Q&A WITH COMMITTEE MEMBERS AND AUDIENCE, 35	
KEY INSIGHTS FROM THE WORKSHOP, 37	
Appendix A Public Workshop Agendas	41
Appendix B Participant Biographies	45

Box and Figures

BOX

- 1-1 Statement of Task, 3

FIGURES

- 2-1 Protected preserved land in Gulf-Houston Regional Conservation Plan, 19
- 2-2 Harris County racial and ethnic majority map and life expectancy, 22
- 2-3 Harris County social vulnerability index and floodplains, 23
- 2-4 Mobile home parks in Houston region with 100- and 500-year floodplain data, 24

PREPUBLICATION COPY—Uncorrected Proofs

Copyright National Academy of Sciences. All rights reserved.

Acronyms and Abbreviations

BUFTX	Black United Fund of Texas Inc.
CBO(s)	community-based organization(s)
CDRC	Community Design Resource Center
CEER	Coalition for Environment, Equity, and Resilience
CIDA	Community In-Power and Development Association Inc.
FEMA	Federal Emergency Management Agency
GRP	Gulf Research Program
GSI	Green Stormwater Infrastructure

PREPUBLICATION COPY—Uncorrected Proofs

Copyright National Academy of Sciences. All rights reserved.

1

Introduction and Background

In 2021, the Gulf Research Program (GRP)¹ of the National Academies of Sciences, Engineering, and Medicine sponsored a two-year consensus study, *Managed Retreat in the U.S. Gulf Coast Region*, to learn about and respond to the unique challenges associated with managed retreat. The Board on Environmental Change and Society in the Division of Social and Behavioral Sciences and Education convened a committee of experts to provide in-depth analysis and identify short- and long-term steps for Gulf Coast communities that may need to relocate. This study is part of the GRP's interest in developing a research agenda for their future programming and relevant fields of study, such as those that address the complexities inherent in relocation as an adaptive strategy to climate change within and beyond the Gulf coast.

As part of this study, the committee convened a series of three public workshops in 2022 in the Gulf Coast region to gather information for the consensus report. Each workshop focused on policy and practice considerations, research and data needs, and community engagement strategies. One of the workshops' principal objectives was to elevate the voices of communities and individuals contemplating, resisting, undertaking, or facing barriers to relocation (including systemic issues such as structural racism),

¹The GRP was established in 2013 from criminal settlement funds from the Deepwater Horizon oil spill and is intended to “advance and apply science, engineering, and public health knowledge to reduce risks from offshore oil spills and will enable the communities of the Gulf to better anticipate, mitigate, and recover from future disasters.” For more information on the Gulf Research program see: <https://www.nationalacademies.org/gulf/about>

as well as individuals who have resettled and communities receiving such individuals. Each workshop included community testimonials and panels of local decision-makers and experts discussing processes and obstacles communities encounter concerning the study's "Statement of Task" (refer to Box 1-1).

The consensus committee selected three locations across the Gulf region. Collectively, these regions represent diverse issues associated with managed retreat and diversity in demographics, including population size. The first workshop was held in two parts in Houston and Port Arthur, Texas. The second workshop was held in St. Petersburg, Florida. The third workshop was held in two parts in Thibodaux and Houma, Louisiana. This proceedings recounts the first workshop in Houston and Port Arthur, Texas.²

PURPOSE OF THE WORKSHOP

On June 8–9, 2022, the study committee convened a two-part workshop in the Gulf region of Texas. The first part of the workshop, "Buyouts and Other Forms of Strategic Relocation in Greater Houston, Texas," was held on June 8, in Houston's Greenspoint area. The second part of the workshop, "Strategic Relocation and Environmental Perception: Community Perspectives from Port Arthur, Texas," was held on June 9, in Port Arthur, Texas.

To address the study's Statement of Task the committee enlisted the assistance of three community-based organizations (CBOs). These were the Coalition for Environment, Equity and Resilience (CEER), a regional coalition of twenty-five member organizations based in Houston;³ the Black United Fund of Texas Inc. (BUFTX), a statewide organization based in Houston;⁴ and the Community In-Power and Development Association Inc. (CIDA), a local organization based in Port Arthur.⁵ These CBOs assisted the committee in identifying residents, local officials and leaders, and other experts to participate in the workshop activities concerning buyouts, other forms of strategic relocation, and perceptions of environmental risks and hazards in the Greater Houston area and Port Arthur, Texas.⁶ The workshop was designed to highlight diverse perspectives and multiple areas of

² Additional details about the workshops are available at <https://www.nationalacademies.org/our-work/managed-retreat-in-the-us-gulf-coast-region>

³ More information about CEER is available at: <https://ceerhouston.org/media-kit#9f85deac-4ed2-4038-824c-39187ca4423e>

⁴ More information about BUFTX is available at: <https://www.buftx.org/about-buftx.html>

⁵ More information about CIDA is available at: <https://www.cidainc.org/>

⁶ Additional details about the workshop are available at <https://www.nationalacademies.org/event/06-08-2022/managed-retreat-in-the-us-gulf-coast-region-workshop-1> including an archived webcast of the first day of the workshop.

BOX 1-1

Statement of Task

The National Academies of Sciences, Engineering, and Medicine will convene an ad hoc committee to conduct a study on the movement and relocation of people, infrastructure, and communities away from environmentally high-risk areas, sometimes referred to as managed retreat, in the Gulf Coast region of the United States. In particular, the study will focus on understanding and responding to the unique challenges in the face of a changing climate along the Gulf Coast (e.g., coastal flooding due to sea level rise, subsidence, land loss). The study will make findings and recommendations based on information gathered about the challenges, needs, and opportunities associated with managed retreat in the Gulf Coast region.

As a way to gather information for the report, three public workshops will be held in the Gulf Coast region. The public workshops will focus on policy/practice considerations, research/data needs, and community engagement strategies. Elevating community voices will be a centerpiece of the workshops. Topics to be addressed across the workshops may include:

- Identifying considerations and best practices for engaging with communities about managed retreat, including effective communication and engagement methods, equity, co-production of knowledge, development of strategies, and involvement in planning and decision-making.
- Understanding managed retreat efforts taking place within the Gulf Coast region, including promising practices to preserve social cohesion and protect traditional and cultural practices as part of managed retreat planning, and what community stakeholders in the Gulf Coast region can learn from them.
- Identifying policy and practical barriers to managed retreat, including issues relating to equity (e.g., who can claim access to various public benefits and services, how displaced peoples are received by and integrated into another community).
- Highlighting key information and data needs and necessary timeframe(s) to plan effectively.
- Identifying research and information gaps, particularly in the social and behavioral sciences, which inhibit effective and equitable planning, communication, and implementation of managed retreat programs.

A publication will be produced by a rapporteur and following institutional guidelines following each workshop.

Following the completion of the workshop series, the committee will produce a report that:

- Synthesizes common themes identified through the public workshop series (e.g., policy and practical challenges, information needs, best practices).

continued

BOX 1-1 Continued

- Incorporates evidence from the literature in areas such as public participation, communication, governance, and decision-making.
- Identifies short- and long-term steps necessary for community stakeholders to plan and implement the movement of people away from high-hazard areas in ways that are equitable, culturally appropriate, adaptive, and resilient to future regional climate conditions.

expertise held by individuals and communities involved in conversations about adapting to environmental hazards.

The committee felt strongly about fully understanding the complex and variable array of perspectives in affected communities, including those associated with mandatory and voluntary buyout programs, other forms of strategic relocation, local decision-making processes, public engagement efforts, and the implications of equity on displacement and relocation. Participants were selected based on planning discussions with committee members and informational calls in which participants and National Academies staff members identified areas of expertise and experiences that would be particularly relevant to the workshop and the broader study.

ORGANIZATION OF THE WORKSHOP PROCEEDINGS

This proceedings summarizes the presentations and discussions highlighted during the workshop. Proceedings may not contain any consensus analysis or views of the committee on the underlying subject matter of the workshop. Proceedings may contain particular viewpoints attributed to individual participants or groups of participants in the workshop, if these attributions can be adequately documented and if the viewpoints are reasonable statements for inclusion in a National Academies proceedings.

The organization of this proceedings is as follows: Chapter 2 summarizes the presentations and panel discussions from part one in Houston, Texas, on June 8, while Chapter 3 provides a recap of the participants perspectives in affected communities in Port Arthur, Texas, during part two on June 9. Chapter 3 concludes with closing remarks of the second part of the workshop. The workshop agenda and biographies of participants and moderators are presented in Appendixes A and B, respectively.

2

Part One: Buyouts and Other Forms of Strategic Relocation in Greater Houston, Texas

On June 8, 2022, the first part of the workshop was held in Houston, Texas. The aim was to hear from residents, local officials, and other experts about buyouts and other forms of strategic relocation in the Greater Houston area. The committee selected participants who could speak to issues relating to mandatory¹ and voluntary buyout programs, local decision-making processes, and public engagement about strategic relocation. In addition, participants were asked to discuss the implications of equity on displacement and relocation.²

COMMUNITY TESTIMONIALS

During the workshop's opening remarks, Lauren Alexander Augustine, executive director of the Gulf Research Program (GRP), stated that the GRP could not do its work without understanding what environmental change meant to the people living there. The first activity of the workshop, community testimonials, was facilitated by Cleo Johnson-McLaughlin, president of the Black United Fund of Texas Inc. (BUFTX). Johnson-McLaughlin introduced the panel and invited panelists to discuss their experience with buyouts and other forms of strategic relocations that have already taken place or are currently under consideration in Greater Houston.

¹More information about Harris County's mandatory buyout program is available at the program website: <https://harrisrecovery.org/post-disaster-relocation-and-buyout-program/>

²A video of the Houston portion of the workshop is available at <https://www.nationalacademies.org/event/06-08-2022/managed-retreat-in-the-us-gulf-coast-region-workshop-1>

Marcus Glenn, BUFTX, provided the first testimony, during which he informed the audience that he grew up in a location fewer than 10 miles from the Port of Houston. He has witnessed the impact of catastrophic events expand from flooded streets to devastated communities and homes; he also stated that the impact on lower-income “communities of color is heartbreaking.” Glenn stated that individuals who have experienced adverse events several times have managed to build resilience but are tired of the problems not being addressed. He questioned why land use planning did not incorporate the natural flow of water. According to him, his community’s concerns are not taken seriously or dealt with due to a lack of funding. Many impacted neighborhoods are also food insecure; therefore, Glenn emphasized local food production and supply considerations to prepare for future events.

Kevin McKinney, Flood Victims of Richwood, shared his experience of the days after Hurricane Harvey.³ As the water drained toward the Gulf of Mexico, their neighborhood in the city of Richwood, located in Brazoria County, was inundated by water for eight days. McKinney asserted that the inundation was because 27.7 billion gallons of water were diverted into his community. While recounting his experience, McKinney stated that “the built environment and urban planning in Brazoria County, [including] approving the development of new housing in areas subject to flooding and diverting water into other neighborhoods without proper planning[,] present reason[s] for other residents to worry about the relocation process and whether we will decide to relocate.” McKinney canvassed his neighborhood with flyers that contained questions regarding buyouts and relocation. During his testimony, he summarized the feedback of 20 people who had seen his flyers. After Harvey, residents were instantly displaced and left their homes with anything they could grab. Most of the families McKinney talked to said that they would never want to experience something like that again. After the flood, each family was on their own—some lived with others, moved RVs onto their properties, and lived in hotels, while others never returned to their homes. No relocation options were offered, and no one McKinney spoke to was aware of possible relocation options. After his conversation with these families, it became clear to McKinney that none of them were offered a buyout or had ever heard of one. However, most did not want to be bought out and were busy concentrating on piecing their lives back together.

³Hurricane Harvey was a Category 4 hurricane when it hit Rockport, TX. It quickly turned into a tropical storm inland and, by the time it reached Houston, there was little wind to move the storm center. Harvey stalled over Houston, depositing 50 inches of rain. As the flooding that resulted is colloquially attributed to “Hurricane Harvey,” this proceedings retains that moniker.

Pleasantville, located by the Port of Houston, was heavily inundated during Hurricane Harvey. Darnell Ozenne, BUFTX, Pleasantville Civic League, stated that city and state officials overlooked flooding in Pleasantville. According to Ozenne, Pleasantville is a family-oriented and supportive community, and some residents prefer remaining in the community if feasible. There are limited programs, resources, and relocation options available to help people—especially seniors—and relocation options can be limited due to income restrictions. Ozenne hopes that city government officials can find different ways and avenues to help seniors and elevate the community's voice.

Liberty County, located in southeastern Texas along the Gulf Coast, is another area where significant rain results in flooding and many residents are still rebuilding their homes from Hurricane Ike (2008). Barbara McEntyre, Coalition for Environment, Equity, and Resilience (CEER) and director of the Liberty County Long Term Recovery Committee, reported that they are a tight-knit and self-sufficient logging community with a large percentage of undocumented immigrants. County residents that were affected by Hurricane Harvey and that are at risk for future flooding were offered opportunities for buyouts. McEntyre recounted that the buyout grant provides 6.4 million dollars for 64 residents;⁴ so far, commitments have been acquired from 45 residents. Many residents' homes are paid for; however, in many cases, they are barely worth \$10,000. As a result, even with a buyout, many residents have nowhere to go. She also pointed out that the Housing Authority's waiting list is consistently over 200 people. According to community feedback that McEntyre received, "the community has been made promises every election, and nothing ever happens," so the community tries to support one another. McEntyre pointed out that of the 7,600 homes affected by Hurricane Harvey, only about 450 homes were being rebuilt. There are approximately 200 residents that still require assistance from the 2021 ice storm, and about 275 residents are still trying to remove mold from their homes following Tropical Storm Imelda in 2019. Furthermore, those without insurance are still trying to find repair funding and have not heard about buyout opportunities. McEntyre stated that the people making decisions do not have "boots on the ground that the community knows and trusts."

Marcial Sanchez, CEER, has lived in the Allen Field community since the age of seven. It is a two-street neighborhood with one way in and one way out. Flooding has been a part of his life. In the past, the com-

⁴The following resource indicates the grant amount was closer to 6.7 million dollars: Houston-Galveston Area Council. (2018). Community development block grant-disaster recovery resources for local governments. <https://www.h-gac.com/getmedia/38040552-a81f-4b42-926a-4933ec637e7c/FINAL-CDBG-DR-Best-Practices-1-7-19.pdf>

munity received financial support from FEMA and always managed to recover. After Hurricane Harvey displaced many community members, Harris County began a mandatory buyout in the neighborhood. Sanchez believes the community is being forced out because “more tax dollars” are needed than his mostly low-income community provides. He mentioned that the contractor responsible for the buyout program and the county failed the Allen Field community because residents were not provided with complete packets of all the required information, and people collecting information did not have experience in the buyout program. As a result, the Texas Organizing Project worked with Harris County and the contractor to hold meetings that enabled residents to ask questions about the buyout program and share feedback. However, Sanchez pointed out that the people who needed to hear from the residents were not present. Additionally, Sanchez would like to know why residents, after two years, are still awaiting an offer for their homes. Due to the time lag, residents lost opportunities for other houses due to the rise in housing market prices. Sanchez asked that local officials come forward and help his community.

Perla Garcia, CEER, is also from Allen Field. Around the start of the pandemic in March 2020, about 50 families in her community received letters concerning the buyout program. Since then, meetings have been held between residents and Harris County to ask questions about the program and share concerns, but there have been various communication issues. Garcia has dealt with many people from the program and felt like they were not doing enough to ensure information reached all residents, of whom many have Spanish as their primary language. Residents have received numerous letters about buyout offers, but these offers were based on values from 2017 and did not account for the total size of the land. She has been unable to find a home elsewhere that would allow her to store tow trucks for her business, and taking out a loan as has been suggested would leave her with debts over \$100,000. She shared that some community members fear that the buyout program may have other motives, such as gaining access to oil in the ground. Before Hurricane Harvey plans were underway for a possible dam to retain flood water, but that has not occurred. However land added to Gray’s Bayou caused ankle-high mud to flow into the Allen Field community during Hurricane Harvey. Due to her house’s elevation, the water did not enter her home, but she was left with water and mud underneath and a damaged roof, but all she received was \$400 for repairs which was not enough to fix the roof. Her experience has been frustrating because she does not want to sell her home and has nowhere else to go. The buyout offer is insufficient to purchase a comparable home, and she does not want to go into debt. She also noted unaddressed health-related issues, such as the added stress caused by the mandatory buyout. Furthermore, she hopes the Hispanic Latino community will be valued and that economic, health, and property issues will be addressed.

DISCUSSION AND Q&A WITH COMMUNITY TESTIMONIAL PANELISTS

Buyout Program Opportunities

After opening the discussion to workshop participants, the facilitator, Johnson-McLaughlin, asked panelists how they discovered buyout program opportunities. Ozenne replied that once his community was made aware of a buyout program opportunity, the home values that were offered prevented it from being a viable option. McKinney commented that none of the residents he spoke with wanted to be associated with a program “if it was not going to benefit us.” Most residents in McKinney’s neighborhood wanted to stay in their homes, and many still owed money on their mortgages. Regarding volunteer buyout programs within his community, Sanchez said that some individuals could break even, while others would need a reverse mortgage to afford living in a new home. Garcia had spoken with residents who felt “disrespected” and felt like they were “being robbed.” However, community-based organizations are trying to fill the gaps left by the local government. For example, another panelist, Teresa Davis, the interim coalition director for CEER, stated that her coalition sets aside space and time for communities, with language interpretation available, so that residents feel informed and educated about the buyout process. Davis said this was particularly important for the Vietnamese population because no documents had been translated into Vietnamese. She further noted that buyouts and health equity are also significant issues and stressed the need to include communities in discussions about moving, displacement, and relocation. McLaughlin added that many problems had not been addressed, and noted the need for elected officials to understand how communities are affected.

Committee member Lynn Goldman inquired about the differences between voluntary and mandatory buyout program processes. In response, Glenn mentioned that many voluntary programs in West Houston took place in more affluent communities, but that he was unfamiliar with any programs for those in low-income communities. In Ozenne’s experience, buyouts have only occurred in cases of property that is of significant value. He mentioned that he witnessed eminent domain utilized for mandatory buyouts. Garcia touched upon possible court fees for residents facing mandatory buyouts. McKinney felt that there were limited options in his community due to the community’s litigation. Sanchez pointed out he was informed that if residents in his community refused to accept the mandatory flood buyout program, their homes would be confiscated and they would be evicted.

Future Efforts

E. Barrett Ristroph, a committee member, asked about future government efforts. McKinney responded that there is a need to hold elected officials accountable and educate communities about the buyout program process. Ozenne also mentioned that many officials are not from impacted communities, and they “need to be people who work with us.” Additionally, Glenn noted that federal agencies such as FEMA should stop searching for reasons (e.g., the levee caused the flood and not the rain) to avoid assisting individuals who want to stay in their homes. Collectively, McKinney, Davis, and Glenn stated that residents do not feel FEMA is qualified to perform an appraisal on their homes. Davis pointed out that there are gaps and loopholes in policies and procedures that are not in the community’s best interests. Hence, she emphasized the need to implement a preplanning program since “we know what’s possible after Harvey.” McLaughlin mentioned that another kind of buyout is to move people by placing an assessed value on someone’s home for which they cannot afford the taxes.

From McEntyre’s perspective, more education is required. The grant writing organization had already established the dollar amount, which was not enough to purchase a similar property elsewhere before they came into the community. If community members were present, they would have provided an estimate of the total amount required. Moreover, an added challenge for some owners with rental properties was finding a new place for their tenants while keeping them in the existing property until the buyout process was complete. McEntyre commented that emergency services would not help those who have refused to accept the buyout program and relocate. She stated that households with elderly and children should not be in a situation where they call emergency services, and no one responds. She also emphasized the need for future emergency preparation at many scales (i.e., city, county, and state levels).

An audience member mentioned that another pressing issue is that of the undocumented population, many of whom do not qualify for buyout programs. Although some buyout programs allow undocumented individuals to participate, many such people are not being reached. In Ozenne’s area, some investors take advantage of undocumented individuals by charging them higher rents; this issue would be timely and costly to resolve.

Committee member Craig Colten observed that some people do not want to leave, but at the same time, they do not want to endure the trauma and cost of flooding again. Colten questioned whether a buyout is an adequate solution or if there are other preferred methods (e.g., elevation). In response, Ozenne stated that “repair and repeat” is perhaps the cheapest option for people since home elevation is costly. Although newly constructed homes can be built as elevated structures, most older existing

homes are not elevated. Furthermore, Ozenne does not think many developers consider the impact of new houses on existing houses. Sanchez obtained a permit to elevate his house after Tropical Storm Allison in 2001 (i.e., the first time his house flooded), but he could not find someone to elevate it as high as the county requirement. Additionally, Garcia does not understand the purpose of being directed to elevate homes above the floodplain while mandatory buyouts are occurring. McKinney mentioned that the Texas Land Commission dispatched a letter to everyone in his neighborhood stating that they had \$30,000 in grant money to raise a house, yet the actual cost ranges from \$100,000 to \$150,000. Sanchez noted that other options could be explored, such as using nearby areas to retain water instead of relocating homes and “wiping out neighborhoods.”

From what Davis gathered from communities, many of them preferred rebuilding and elevating because the so-called “affordable” housing option is not affordable for most residents. McEntyre suggested the need to find solutions to fix homes since many families did not want to move. In addition, based on the resident’s location, other affordable options were limited. McEntyre touched upon beneficial activities such as expanding ditches to retain more water. However, she wants to see land use plans account for additional water added to an existing area during new development.

A member of the audience asked panelists to consider long-term solutions, such as environmental restoration, and wondered if there have been community-level conversations between government officials and the community. In reply, McKinney stated that following Harvey, elected officials wanted to fill and build a subdivision on 968 acres of wetlands with retention ponds, which could have increased the water in his neighborhood. In this case, the developer backed out, but McKinney stressed the need to consider the bigger picture when making changes to the land. Glenn also suggested looking at possible ways nature could restore ecology and ecosystems, which may help determine actions and resources needed for communities to recover from extreme climate-related events.

Place, Identity, and Loss of Community

Thomas Thornton, board director for the National Academies of Sciences, Engineering, and Medicine’s Board on Environmental Change and Society, recognized the panelists’ expression of a strong sense of place and identity with their communities—yet, he pointed out, buyout decisions and relocation site decisions are largely made by individuals and households. He asked about community values lost in this process and how community relocation can be facilitated as an adaptation to flooding. Ozenne replied that it depended on each community since those with stronger community ties look out for each other. He went on to say that

residents who are no longer as connected to their community might opt for a buyout, but not for a low value. Ozenne, Sanchez, and Glenn noted that community identity and history are often lost when buyouts and displacement take place. Furthermore, Davis and Ozenne made a point about inviting the community to co-create and problem-solve solutions to displacement. McKinney noted that “what we lost was the trust of the elected officials and trust of the federal government,” further stating that they would like to be part of the process and regain trust. He touched on the resilience of his community and the ways by which the community managed to support itself.

Dolores Mendoza, an audience member who lived in the Allen Field neighborhood, moved due to the mandatory buyout program. She said that she had been doing well as a single parent with a moderate income. However, in her new home, she faced higher taxes, homeowner association fees, and new bills (e.g., a water bill). She mentioned that she lives paycheck to paycheck, has a three-hour commute every day, and that her children are facing stress as they adjust to a new school. She no longer has the support of her family, church, and community, and she does not know how to help her children manage their way through something so foreign to her. No one in her neighborhood was involved in the early stages of developing the mandatory buyout program. She sold her “forever home forcefully” and has noticed that the county is not maintaining it. As a result, it is now being vandalized and used as a dumping ground. However, she shared her key takeaway: elected officials should make ground-level decisions by talking to residents and receiving their input. She had hoped the buyout program would be a more straightforward process for all those after her, but, after two years, she thinks the buyout process is still poorly executed as her old neighbors are still living in homes with mold and leaky roofs. McEntyre commented that she also had experienced increasing expenses for flood insurance.

CHALLENGES, OPPORTUNITIES, AND LESSONS LEARNED FROM BUYOUT PROGRAMS AND HOUSTON AS A RECEIVING COMMUNITY

Harris County Buyout Program

Ray Beltran, a Community Engagement Coordinator for Harris County, Precinct 1, commenced the second session by noting his role as a conduit between Allen Field residents and the department managing the buyout program. His office received a notice about the buyouts around the same time community members did—around the beginning of the COVID-19 pandemic. Part of Beltran’s job was to identify issues and the concerns of

residents about the buyout program. He stated that he started by reaching out to other people who had gone through a buyout program in the United States. By doing so, he learned that the customer service component determined program success and that Harris County faced challenges he did not see in other buyout programs. For example, Harris County has more diversity, especially in terms of language. Due to the COVID-19 pandemic, Harris County could not have in-person engagement and interaction, which “complicated matters ten-fold.” Beltran felt that conversations about buying a home, especially for Latino communities, needed to happen in person. Subsequently, he was able to hold such conversations with the help of people like Perla Garcia, who convened neighbors in her front yard. His challenge was to find how to serve residents and ensure that he did not overstep his position since another county program was managing the buyout program. Another challenge Beltran highlighted was that the Allen Field community had not heard from anyone in the county in several years. However, when they did, the community was told to leave; so when Beltran came in, tensions were understandably high.

The buyout program for Harris County used property values from 2017 and assumed property values would decrease because of additional flooding. However, Beltran highlighted that the housing market experienced an approximately 30 percent median increase in property values. This would make it difficult for residents to purchase a home outside of the floodplain that was comparable to their current one using only the amount of money offered by the buyout program. Additionally, U.S. Department of Housing and Urban Development funding restrictions made households of undocumented and mixed legal status ineligible for the buyout program. Beltran announced that his first goal was to ensure that everyone would be able to receive payment for their property. The Special Assistance Funding Effort program was created with 1.3 million dollars in local funds for undocumented households to receive offers for their properties.⁵ Lastly, Beltran identified this buyout program as, arguably, the first of its kind. Therefore, it has been a learning process to ensure that outreach and engagement are inclusive. He hopes that future buyout programs will be both an easier process and significantly more equitable.

Advancing Federally Funded Disaster Recovery Projects in Houston

Ryan Slattery, the senior advisor of sustainability and resilience in the Houston Mayor’s Office, is responsible for advancing large, federally-funded disaster recovery projects focused on building resilience. First articulating a hopeful perspective, he stated that buyouts are a tool to be

⁵For additional information about the program see: <https://harrisrecovery.org/legal-status/>

employed equitably to provide the best possible outcomes for communities. Yet, he emphasized that managed retreat will not mitigate flooding for all of Houston. 237 square miles are in a floodplain, which affects 160,000 properties (37% of the city of Houston). Slattery mentioned that 50 properties were recently bought out, with an average of \$230,000 per property, which was a long process and utilized a lot of time and resources.

The city of Houston was awarded 23 million dollars from a Community Development Block Grant for planning efforts. Slattery hoped to work with community members and key stakeholders to develop a framework for a buy-in/buyout program and to assess whether the program can provide a safe space for residents within the community to relocate to, thus maintaining the continuity of the community. According to Slattery, the most challenging part would be finding high ground in Houston, which intersects with 23 watersheds. Thus, to invest in maintaining community continuity, the city of Houston will need to understand which areas experience repetitive loss and which investments can be made in or adjacent to affected communities. Slattery would like to believe that some parts of the Houston area can serve as a sending community and other parts can serve as receiving communities, but he acknowledges that this scenario is not feasible in each part of Texas.

Intersections Between Low-Income Housing and Disasters in the Greater Houston Area

Shannon Van Zandt, professor of landscape architecture and urban planning at Texas A&M University at College Station, said that Houston is the largest city that she knows of that repeatedly and regularly experiences hazards. The city is also rapidly growing and is one of the most diverse major cities in the country; hence, there are multiple dynamics to account for. Van Zandt stated that “low-income people live in low-quality homes in low-lying areas” is an oversimplification. People may not receive information in the same way, have the same financial or social resources as others, or may not be as active or engaged in their community’s power dynamics; however, this does not mean they are not resilient. Instead, she noted, it highlights the compounding aspects of disaster risk and exposures through physical and social vulnerability (e.g., living in low-lying areas because of structural racism through zoning, mortgage, and finances) within the house and community. The existing literature consistently shows that “low-income communities and communities of color are more likely to receive greater damage during a disaster.” Yet, in the immediate wake of a disaster, it can be difficult to identify the communities that are most in need of help. Housing prices have also increased in the last three years, further constraining the Houston housing market. Van Zandt pointed out it is

often difficult to get out of harm's way because of the difficulty in finding affordable housing with similar amenities and the same sense of community.

Van Zandt pointed to research done by her graduate student, Ki Jin Seong, whose dissertation looked at buyouts in Austin and found that approximately half of the families taking buyouts relocated to a flood-prone area.⁶ Based on these findings, Van Zandt suggested that mobility counseling could be used in the relocation effort. Houston has a higher renter rate than many major cities, with a homeownership rate of just 50 percent as compared to a national rate of 68 to 70 percent, thereby creating problems in terms of the availability and location of rental housing. In addition, speculative buying in Houston has been taking place since Hurricane Harvey. Van Zandt mentioned that investors are purchasing single-family housing and renting or sitting on it, further reducing affordability. Seong's research also found that neighborhoods with a critical mass of buyouts witness lower housing values, increased minority concentration over time, and increased renters. Consequently, they become ghost subdivisions where lots are empty and overgrown. Van Zandt stated that Houston should investigate the remediation of vacant lots after buyouts; for example, adding amenities like floodable community gardens, which could help keep housing values up and absorb future flooding.

Lessons Learned in the Mandatory Buyout Program in Harris County

Shirley Ronquillo, co-founder and community activist for the Houston Department of Transformation, aims to elevate residents' concerns in mandatory buyout programs. East Aldine, where Ronquillo resides, is a community of predominantly Spanish-speaking families (62.6% of people over the age of 18) with mixed status in unincorporated Harris County, which Ronquillo noted "was the first local government entity to use mandatory buyouts as a means to mitigate flooding." At a meeting in August 2017, mandatory buyouts were listed as an item on the agenda, but nothing was advertised in Spanish and there were no engagement efforts.

In 2019, Ronquillo was contacted by a consulting firm to help get the word out about the house rehabilitation assistance, residential buyout options, and down payment assistance programs. During that period, the public was told that some communities would have buyouts, but specifics were not discussed, nor was a timeline offered. During the pandemic, the Harris County Community Services Department held the first two town hall meetings in English. By the second meeting, some communities had not yet

⁶Seong, Ki Jin (2021). *Living with Floods: Longitudinal Impact of Floodplain Buyouts on Neighborhood Change*. Doctoral dissertation, Texas A&M University. <https://hdl.handle.net/1969.1/195298>

been notified that they would be part of the mandatory buyout program. Ronquillo stated that the information needs to be distributed in culturally appropriate ways while accounting for varying literacy levels, and she noted that many community members were unfamiliar with virtual meetings.

As the program progressed, Ronquillo's community also discovered issues that prevented people from qualifying for a buyout, such as lack of an adult with legal status in the household, proof of home ownership, and missing receipts for repairs. Additionally, evidence of previous relocation support decreased the funding available for some residents. Ronquillo is in support of a federal policy enabling residents to have a seat at the table and hopes that this experience will be shared with other entities. Lastly, she stressed the importance of collaborating with community partners to get the word out to address resident concerns.

**DISCUSSION AND Q&A WITH PANELISTS:
“CHALLENGES, OPPORTUNITIES, AND LESSONS LEARNED
FROM BUYOUT PROGRAMS AND
HOUSTON AS A RECEIVING COMMUNITY”**

Buyout Location Criteria

The moderator of the panel, E. Barrett Ristroph, a committee member and principal and founder of Ristroph Law, Planning and Research, initiated the discussion by asking how mandatory buyout locations, such as Allen Field, are chosen. In response, Beltran mapped the guidelines for areas that received two feet of water during Harvey in a 100-year floodplain in a low to moderate-income community. Alexander Augustine questioned if the repetitive loss is a criterion. Van Zandt suspects it was but was not sure. Slattery drew everyone's attention to Harris County Flood Control District's explanation of where funding comes from and where it goes,⁷ which considers repetitive loss as part of its criteria. Van Zandt pointed out that, as the first panel brought up, one issue is the difficulties the communities encounter when applying for available funds (e.g., lack of knowing what is needed to apply and how to get data to complete the forms).

Tools for Developers

A committee member, Lynn Goldman, noted that many panelists commented that nearby land development increased the water flow into their communities, and she asked about tools or modeling available to protect

⁷To view Harris County Flood Control District's funding sources, please visit <https://www.hcfcd.org/About/Partnership-Funding> and click on the image to the right of “funding sources.”

other properties. Slattery responded that they try to use strict floodplain ordinances, but zoning conversations in Houston are complicated. He said, “if it were easy to solve, it would be solved by now... but it’s not easy, and we can’t just throw money at it.” To protect Houston communities, Slattery hopes stakeholder engagement will provide everyone, including the development community, with an assurance that they will have a seat at the table.

Committee member Craig Colten pointed out that cities often look favorably on development and was curious if there was a way to use prudent long-term planning to offset potential costs for communities that suffer from repeat flood damage. Ronquillo stated that one cent of every dollar spent goes toward a special community fund. Many residents wish to remain in their existing communities, but there are no policies that she knows of that cater to this issue. However, there are many opportunities to address issues and keep communities intact. After Slattery noted that Houston is “a developer[-oriented] city” and Van Zandt interjected that Texas is “a developer-[-oriented] state,” Slattery stated that he hopes to work with developers to create an affordable housing program in the community to relocate people out of harm’s way.

Future Opportunities and Lessons Learned

Gavin Smith, a committee member, asked the panel about the lessons learned. According to Beltran, the need for notices and letters in more than one language and making conversations accessible to the entire community was the biggest lesson—this was seconded by Slattery and Ronquillo. Slattery said that identifying and including key stakeholders to help guide decisions is paramount. Furthermore, Van Zandt spoke about Houston’s need for planning a constant state of recovery as part of the normal planning process. Ronquillo noted the need for a culturally competent community assessment in all policy recommendations and increasing communication among different government entities involved because needs are continuously changing. Therefore, answering that they “didn’t account for, budget for, or have funding for something that is impacting lives is not right.” Ronquillo noted that social media is a potential way to start connecting with people.

A panelist, Susan Rogers from the University of Houston, pointed out that she is concerned about the use of consultants for buyout programs and questioned if the city of Houston used any sociologists or social workers on their teams. Slattery mentioned consultants as an opportunity for a city to expand its bandwidth so that community engagement can be provided more efficiently. Ronquillo hopes the city of Houston will recognize the gap between consultants, leadership, and the buyout programs and consider

that the community participants are often retired. She noted that, typically, people such as Perla Garcia that are working and running their businesses are not involved in decision-making discussions.

IMPLICATIONS OF INEQUITY FOR DISPLACEMENT, HEALTH, AND COMMUNITY WELLBEING

Regional Conservation Work After Buyouts Occur

Deborah January-Bevers, the president and CEO of Houston Wilderness, began the third session with a description of her work in collaboration with environmental, business, and governmental entities to implement an ecosystem continuity and connectivity plan for the region,⁸ including restorative work after buyouts occur. There are ten distinct eco-regions in the Houston area, which overlap with an eight-county initiative with three main goals that could affect buyout locations:

1. Increase green space from 15 percent to 24 percent in protected or preserved land by 2040;
2. Reach 50 percent in nature-based stabilization techniques by 2040; and
3. Work towards a 0.4 percent annual increase in organic carbon capture sequestration through native soil, plants, and tree enhancements in the region.

With those goals in mind, January-Bevers shared a map of protected/preserved land in the Houston region where opportunities may exist (see Figure 2-1).

January-Bevers cautioned that communities need to be protected as much as possible, so this would only be for areas that need or want to be bought out. As of now, seventeen areas are being targeted along riverine corridors or existing green spaces. Through an evidence-based collaborative effort, a two-prong approach will be used to create river and waterway resilience in newly available green spaces in the region. More specifically, the approaches are (1) voluntary purchase of residential and commercial properties by respective counties or cities, and (2) Green Stormwater Infrastructure (GSI) techniques, which will be collaboratively implemented as restorative enhancements on targeted buyout properties for improved sustainability and habitat. GSI will be implemented in two ways, including large-scale native tree plantings and native grass bio-

⁸For additional information on the Gulf-Houston Regional Conservation Plan see: <http://gulfhoustonRCP.org>

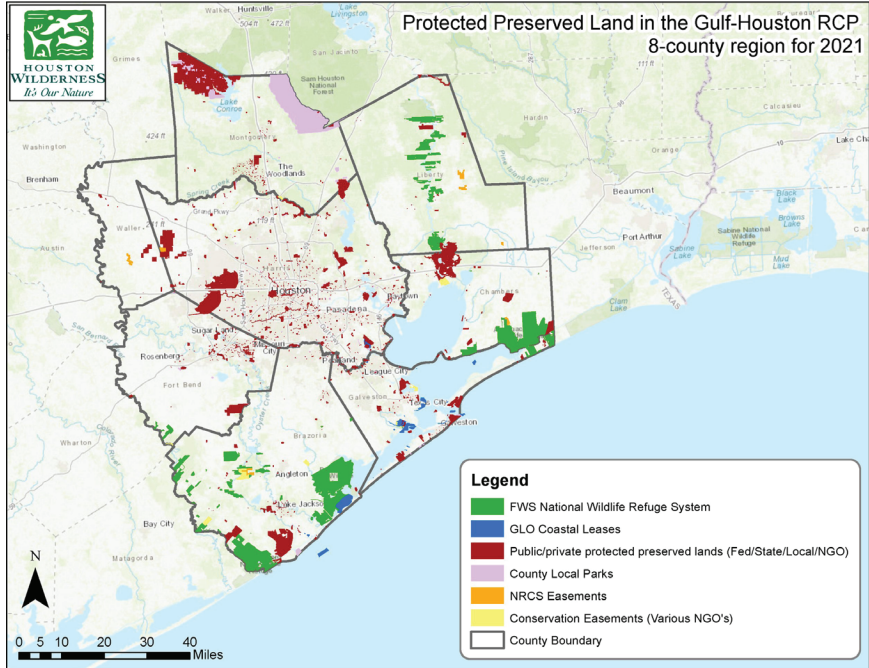


FIGURE 2-1 Protected preserved land in Gulf-Houston Regional Conservation Plan.

SOURCE: January-Bevers, D. (2022). *GIS map of Protected Preserved Land in Gulf-Houston RCP 8-County Region, Houston Wilderness*. Slide 4. Presented at the National Academies workshop: Buyouts and Other Forms of Strategic Relocation in Greater Houston, Houston, TX. Retrieved from: <https://www.nationalacademies.org/event/06-08-2022/managed-retreat-in-the-us-gulf-coast-region-workshop-1>

swales that bookend public parks. Furthermore, additional contiguous green space will contribute to community resilience, including access to green space for residents with potential environmental health impacts. January-Bevers mentioned that the goal was to get all 17 areas done with community support.

Resilience by Design

Susan Rogers, an associate professor and director of the Community Design Resource Center (CDRC) at the University of Houston's College of Architecture, shared some of her CDRC work and explained the importance of design. CDRC uses shared leadership and decision-making from beginning to end to “define, develop, and apply transformative design strategies” and focus on communities because “place and design matter.”

Rogers said that they listen more than they talk and meet people where they are, doing their best to eliminate participation barriers (e.g., offering child-care, offering meetings and resources in multiple languages). Rogers stated that “everyone needs a safe space to voice their concerns and be heard,” and if “we can do that right, we will improve our trust and belief in public institutions that serve us, which we need more than ever.”

Rogers shared that a large volume of work was done at the city and county level after Harvey to determine what can be done to better address the flood challenges. Her work with Greens Bayou shows that while tens of thousands of families have been affected by flooding, it had not received the same amount of analysis or funding as other watersheds. For example, Greens Bayou has roughly the same number of people, has been flooded roughly the same number of times, and affected nearly the same number of people as the Brays Bayou watershed; yet until 2016, 350 million dollars had been spent on mitigation efforts in Brays Bayou compared to 19 million dollars in Greens. Rogers suggested that this is evidence of the “lack of equity that has historically impacted flood mitigation investment for communities.” At the same time, the Sims Bayou Federal Flood Damage Reduction Project is evidence that these programs can successfully remove people from the floodplain.

Rogers stated that cost-benefit analysis requires mitigation projects to yield a positive economic return at the federal level, which is much harder to achieve in areas with lower property values. This formulation of property value does not include the human values of place and home. She addressed housing affordability, which challenges buyouts in communities such as Allen Field. Rogers mentioned that investors that purchase houses all over Houston, including in flood zones, affect neighborhoods of color far more than other neighborhoods. For example, due to investors, the previously predominantly owner-occupied Sunnyside community is now 37 percent renters. There are other inequities across scales, and Rogers stressed that recovery could not happen if resources available for recovery are inaccessible. Additionally, she suggested that local partners should be included in big disaster recovery project teams because “relationships among human beings are fundamental glue that holds us together or does not.”

Community Health and Flooding Displacement

Elizabeth Van Horn and Carolyn White, urban planners for the Harris County Public Health Department, examined how design, planning, and development affect health in Harris County—an increasingly ethnically diverse county with over 4.7 million people. Between 1980 and 2020, the county population increased by 96 percent, mostly in unincorporated areas; as a result, White and Harris report, there has been an extensive

conversion of natural landscapes to hardscapes, affecting flooding, flood resilience, ecosystems, and people. White explained that they looked at the susceptibility and vulnerability of communities to floods, sensitivity (i.e., how likely an individual is to be harmed), and how those balance with adaptive capacities.

White shared housing and transportation Social Vulnerability Index factors that may weaken a community's ability to prevent human suffering and financial loss in a disaster in Harris County; these include the widespread prevalence of multi-unit housing, crowding, and lack of zoning. Van Horn pointed out that many historically black neighborhoods were originally communities that had moved outside then-city limits for opportunities for home ownership. The city later incorporated these areas, which has affected services available in those communities. Van Horn shared two maps highlighting areas with higher Black or African American populations, which correspond to areas with the lowest life expectancy (See Figure 2-2).

Van Horn noted that unaffordable housing can hurt health, and shared a housing cost-burdened map indicating where homeowners spent more than 30 percent of their income on housing, which is considered unaffordable. She further noted that 30 percent of a low income is more burdensome than 30 percent of a high income.

White identified where vulnerable communities and floodplains intersect, revealing where capacity-building opportunities may exist (see Figure 2-3) in communities to help residents cope.

Van Horn stated that their work investigates the health effects of repetitive flooding (e.g., mold exposure, bacterial infections, waterborne diseases, and exposure to toxins), health effects of displacement (e.g., disruption of social networks leading to mental health concerns, and overcrowding and communicable diseases), and the overlaps between them (e.g., mental health and stress-related heart conditions) that are outside of the individual's control. Moreover, they looked at adaptive capacity and mitigation options, such as flood mitigation using retrofits, buyouts, GSI, and natural channel design.

Manufactured Home Parks and Managed Retreat

Andrew Rumbach, an associate professor of landscape architecture and urban planning at Texas A&M University at College Station, shared unique challenges faced by people living in and relying on mobile home parks, where many residents struggle during and after disasters. Over 85 percent of mobile homes are not mobile; instead, they are tough to move and even moving them can result in insurance issues. In the U.S., 17.5 million people live in mobile homes, including manufactured

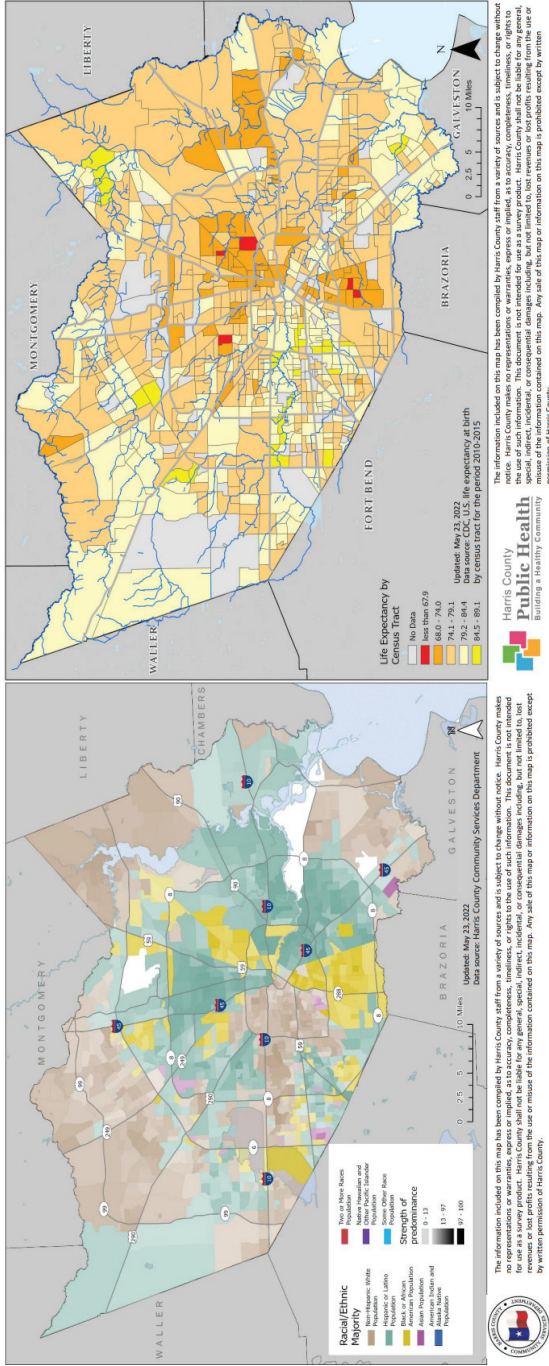


FIGURE 2-2 Harris County racial and ethnic majority map and life expectancy.
SOURCE: White, C., and Van Horn, E. (2022). *Community health and flooding displacement*. Slides 9–10. Presented at The National Academies workshop: Buyouts and Other Forms of Strategic Relocation in Greater Houston, Houston, TX. Retrieved from: <https://www.nationalacademies.org/event/06-08-2022/managed-retreat-in-the-us-gulf-coast-region-workshop-1>

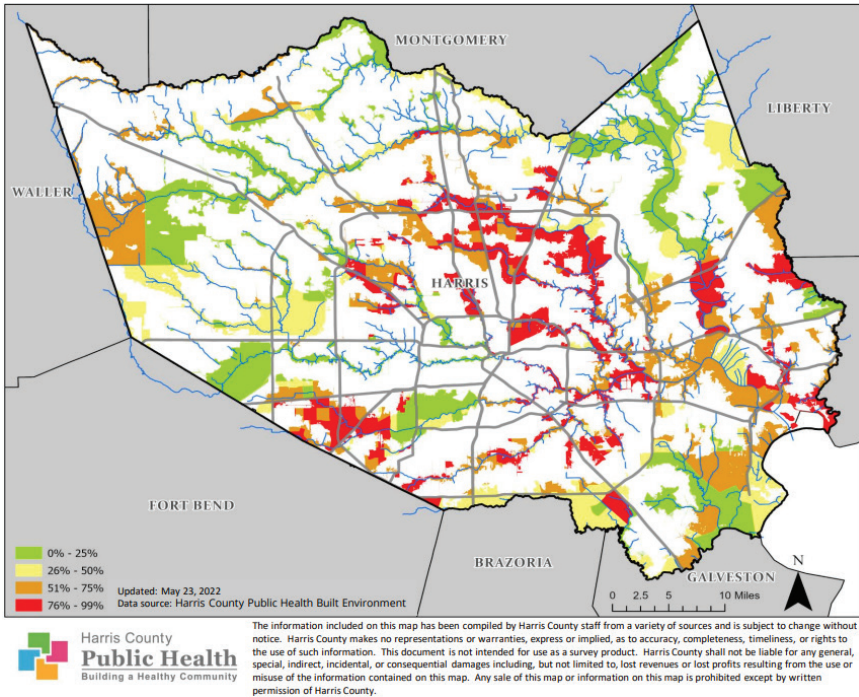


FIGURE 2-3 Harris County social vulnerability index and floodplains.

SOURCE: White, C., and Van Horn, E. (2022). *Community health and flooding displacement*. Slide 12. Presented at The National Academies workshop: Buyouts and Other Forms of Strategic Relocation in Greater Houston, Houston, TX. Retrieved from: <https://www.nationalacademies.org/event/06-08-2022/managed-retreat-in-the-us-gulf-coast-region-workshop-1>

homes,⁹ mainly in sunbelt states like Texas, Florida, and California. Approximately 2.9 million mobile homes are in land-lease communities, where land is rented and the mobile homes are owned. Mobile homes are affordable (on average, they cost half the price per square foot as compared to site-built housing), attainable (fewer barriers than other affordable housing types), and available—providing three times as many units as public housing. Additionally, they have walls that are not shared with neighbors, thereby creating privacy.

⁹A manufactured home is a “dwelling unit of at least 320 square feet in size with a permanent chassis to assure the initial and continued transportability of the home.” Mobile homes and manufactured homes are distinguished by manufacturing date; the term “mobile home” refers to units built prior to 1976, while those built in 1976 and after are considered manufactured homes. The term “mobile home” was used to refer to both throughout Rumbach’s presentation.

Rumbach reported that mobile home parks are difficult to analyze because they are not identified by planning data sources such as census tracts. It is difficult to know where mobile homes are (e.g., tax records, trees blocking satellite views, and over-counting). Furthermore, he said, many regulations require them to be “physically invisible” (i.e., built behind fences). “[I]f you’re invisible, you’re vulnerable,” Rumbach said. His research estimates over 800 mobile home parks in Harris County, which he said are essential to consider when developing equity-informed disaster policies.

In Houston, Rumbach noted, mobile home parks are in areas with lower household income and education, large households (which are associated with more Hispanic/Latino and fewer non-Hispanic Black residents), and historically exclusionary land use policies. He highlighted that it is not just rural housing; rather, they are most prevalent in Houston in moderately urbanized areas close to the central business district. Many mobile home

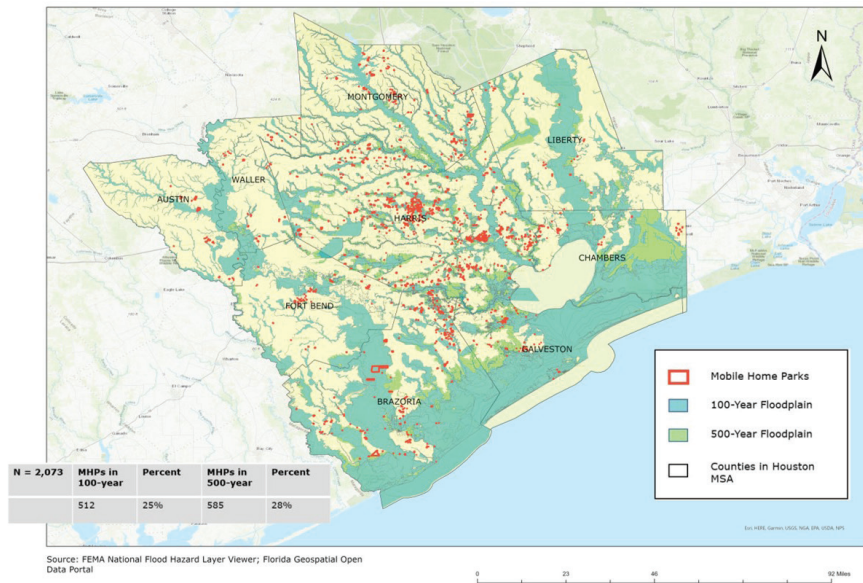


FIGURE 2-4 Mobile home parks in Houston region with 100- and 500-year floodplain data. SOURCE: Adapted from Sullivan, E., Makarewicz, C., and Rumbach, A. (2022). Affordable but marginalized: A sociospatial and regulatory analysis of mobile home parks in the Houston metropolitan area. *Journal of the American Planning Association*, 88(2), 232–244. Rumbach, A. (2022). *Manufactured home parks and managed retreat: Foundations & key questions*. Slide 16. Presented at The National Academies workshop: Buyouts and Other Forms of Strategic Relocation in Greater Houston. Houston, TX. Retrieved from: <https://www.nationalacademies.org/event/06-08-2022/managed-retreat-in-the-us-gulf-coast-region-workshop-1>

parks are located on relatively low-value land that often floods. Rumbach shared a map depicting mobile home parks overlaid with floodplain data for 100- and 500-year floodplains, showing almost a quarter of the land (24.8%) is in a mapped 100-year floodplain. This compares to 18.7 percent of land in census block groups with no mobile home parks and 19 percent of land in the region overall.

From a social equity perspective, Rumbach explained that buyouts could disrupt an entire neighborhood relatively easily, and many individuals may not have the resources or legal status to advocate for themselves. Also, because mobile homes are often not visible or noted as such in government records, owners are often not represented in decision-making processes around relocation. Since residents of mobile home parks do not own the land, in most cases they would not be recipients of buyout programs. Rumbach also questioned what would happen to fixed assets (like mobile homes) that cannot be moved. From a policy perspective, mobile homes are treated like businesses, but from a community perspective, they are housing and a “crucial part of our affordable housing system.”

Q&A WITH COMMITTEE MEMBERS AND AUDIENCE

Future Considerations

Moderator Lynn Goldman, committee member and Dean of the Milken Institute of Public Health at George Washington University, asked panelists to reflect upon efforts to move forward. One challenge faced by Houston is that flood development regulations change frequently. However, Rogers pointed out that flood problems do not have an interest in property lines. Accordingly, there is a need to understand flood issues across scales, and consider regional challenges while also respecting the role the natural environment can play to help alleviate flooding. Rogers also noted the lasting mental health effects of Hurricane Harvey, asking the audience, “Am I right? All of us have PTSD. Every time there’s a threat of a heavy rain, we keep our[selves] at home.” January-Bevers commented that decision-makers should understand their local soils and make decisions based on that. For example, benefit transfer¹⁰ from areas in the Midwest was relied on, which is not true for the clay soil in the Houston area, which causes more pre-

¹⁰Benefits transfer is understood as “a practice used to estimate economic values for ecosystem services by transferring information available from studies already completed in one location or context to another.” United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, World Bank, 2005, *Handbook of National Accounting: Integrated Environmental and Economic Accounting 2003, Studies in Methods, Series F, No.61, Rev.1, Glossary*, United Nations, New York, paragraph 9.107.

precipitation runoff. To combat this issue, White suggested stream restoration and natural channel design throughout the watershed.

Goldman asked about the efforts to target communities that, historically, have not been sites of restoration work. White stated that such efforts should frame opportunities holistically. In response, Rogers brought up a FEMA funding analysis from 2019 that found that 85 percent of buyout funding has benefitted white neighborhoods. In some areas, there are new residents with no recollection of the catastrophic aftermath of Harvey and a large percentage of renters. Some progress has been made, however. For example, Texas implemented a law requiring landlords to disclose a property's flood history. However, Rogers pointed out that disclosure only happened if a potential renter asked (i.e., they were not mandatory), so efforts still need to be made.

Health Resources

Janice Barnes, Committee co-chair, asked whether health resources are available for those like Perla Garcia. White said Harris County Public Health provides a coordinated disaster response focused on mental and physical healthcare, as well as disaster response assistance through longer-recovery programs. Community preparedness assessments have been conducted in multiple languages to help educate residents on how to prepare for an emergency and provide guidance on longer-term activities to increase community resilience. Barnes noted that coordination of mental health resources is vital. Rogers felt that civic infrastructure devoted to disaster recovery is critical; she reported hearing that people want such infrastructure to be located in their communities and put in place before disasters. Still, January-Bever noted that the discussions surrounding the creation of "neighborhood centers" have stopped. To provide context, Shirley Ronquillo advised that many people in Allen Field did not qualify for the resources from Harris County Public Health. She noted that, during disasters, there has been a disconnect in getting people to the proper safe location, so it's not just about having the center but also getting people there.

Proactive Long-Term Planning

Committee member Craig Colten asked if there was a way to build, in advance, towards safer areas without the consequences of sprawl and flood risk to lower-lying communities for long-term planning. Van Horn replied that this type of planning would require sacrificing the "American Dream." Instead, she suggested that people with resources may have to make some sacrifices and that building more densely may help. Rogers replied that too much is asked from those who do not have enough, instead of asking

from those who have more than enough. Rumbach offered that the local governments have different land rules, which can create sprawl; therefore, “it is a regional issue that requires regional solutions.” Additionally, he emphasized the need to look at a smaller scale. For example, census blocks can obscure a lot: within a higher-income block, there might be a pocket of lower-income families.

Additionally, Rumbach pointed out that many health issues stem from uncertainty. Currently, one of the fundamental problems with buyout programs is the uncertainty they create for people; money moving slowly through federal programs to people who need it is only one example. Rogers said, “each community that identifies as a whole, however that might be, has a solution that is right for them, and we have to figure out what that is by talking to people.” She wondered why someone could not just come in and pay for the damage.

Barnes asked if there have been any efforts for homeowners on larger parcels to contribute to stormwater management via onsite water retention. White responded that there is a requirement for a certain volume of retention required at all scales down to two or three lots, and mitigation is required when adding concrete or pavement. Van Horn suggested thinking proactively about buying out owned and undeveloped properties to retain stormwater to prevent the need for further buyouts.

McKinney noted that some retention ponds drain into neighborhoods once they reach capacity. January-Bevers recalled post-Harvey discussions about ways to connect retention ponds; she was unsure what the status was but thought it should be revisited. White also pointed out that to a certain point, flood control does that. Moreover, Ozenne suggested using trees that can absorb water better than others, and wondered why some HOAs prevent people from purchasing these.

CLOSING REMARKS

Goldman wrapped up the workshop by reflecting on the day’s discussion regarding the different types of strategic relocation, such as mandatory and voluntary buyouts, relocation within existing communities, and individuals moving due to tax increases. On the other hand, many residents have stayed and experienced a cycle of repeated flood recovery and repair, but differences arose with Hurricane Harvey. She emphasized the following points:

- Differences of opinion were heard from participants about sources of risk that appear to be tied to the natural and the built environment, and the interaction between them and changes to the natural environment, such as paving and removing vegetation that absorbs

floodwaters. There is a possible option of remediating or modifying that.

- Many workshop participants expressed a need to better understand the functions and limitations of these programs and how to align them with the community's wishes (e.g., some prefer to elevate while others prefer mandatory buyouts).
- Several participants commented on constraints such as relocating to an area that also experienced flooding and not being able to receive the resources and funding needed for relocation.
- Stories were shared about what happened after a home is bought out, which can create problems in the remaining community.
- Individual participants raised questions about why appraisals have not accounted for a shifting real estate market, whether prices are fair enough for relocation into a comparable situation, and how to do buyout programs moving forward.
- Some workshop participants expressed that buyouts have disproportionately benefited wealthier communities compared to lower-quality, lower-lying houses in lower-income communities.
- Several participants pointed out that government mistrust partially emanates from history and partially from a breakdown in governmental processes for buyouts (e.g., not providing understandable information in their language).
- Some panelists suggested that decisions should be made with community participation.

In her final comment, Goldman stated that a criterion for buyouts is repeated flooding, which can be traumatic, so a need was expressed by many participants for identifying and implementing healthcare and mental health care, food security, and social services in these areas.

3

Strategic Relocation and Environmental Perception: Community Perspectives from Port Arthur, Texas

During the second part of the workshop, on June 9th, 2022, residents and local leaders shared their perceptions of environmental risks and hazards and discussed the concept of managed retreat. The committee selected participants to learn about and discuss forms of strategic relocation under consideration, including issues relating to local decision-making processes and public engagement, and discuss the implications of equity on displacement and relocation.

As summarized at the end of the workshop by committee member Craig Colten, much of the discussion during the second part of the workshop centered on experiences arising from hurricanes, flooding, and proximity to petroleum refineries. Most of the participants were from the west side neighborhood, which is low-lying and adjacent to two major petrochemical processing facilities. Residents of the west side have faced problems from flooding, hurricane-induced rainfall, and heavy rains that occur year-round. They also face exposure to emissions from the nearby industrial facilities. Currently, there is no local buyout program available.

Thurman Bartie, mayor of Port Arthur, gave a brief welcome speech about community and trust in leadership. He mentioned a mixed-use development master plan for Port Arthur downtown to revitalize and attract single-family and multi-family housing, where individuals can live, work, and shop in the same area.¹

¹For more information about Imagine Port Arthur, the Downtown Revitalization Plan, see <https://www.portarthurtx.gov/485/Imagine-Port-Arthur>

THE PORT ARTHUR, TEXAS COMMUNITY

Hilton Kelley, the founder and director of Community In-Power and Development Association Inc. (CIDA), thanked everyone for sharing their stories and talking about their experiences during Hurricane Harvey. Regarding managed retreat, he said that there might be some reasons for Port Arthur to participate, such as a lack of adequate housing. Kelley encouraged participants to consider:

- How urban planning and the built environment can help or hinder relocation decisions and processes;
- How climate hazards like flooding intersect with environmental justice issues;
- What the thresholds are for determining whether to stay, rebuild, or relocate;
- What relocation options exist;
- How to learn about relocation options;
- Where to go in a relocation scenario;
- The time needed to make these decisions; and
- The support required for paperwork.

Kelley spoke about his love for Port Arthur and growing up in Carver Terrace, the first public housing project built in Port Arthur on the west side. The complexes were intended to help people to get on their feet but have turned into multi-generational housing. Across West Port Arthur, shotgun houses were quickly built, attracting African American people from Louisiana, Mississippi, and Florida to come to Port Arthur. Many moved to muddy, marshy areas on the outskirts of town in West Port Arthur that were hard to farm because housing elsewhere was unaffordable. Kelley grew up next to the Motiva oil refinery, formerly the Texico refinery, and the Valero oil refinery, formerly Gulf Oil.² As the oil and gas industries grew in nearby Beaumont, people started to move closer to the water (i.e., towards Port Arthur) for shipping lanes. Two decades after leaving Port Arthur, he returned and started organizing and bringing people to the table to address environmental justice, social discrimination, and economic issues. He created CIDA and began focusing on environmental justice issues and reducing industrial air emissions, which have been linked to cancer, liver, and kidney disease among Port Arthur residents.

As Port Arthur started getting hit by storms causing annual flooding, Kelley's work turned from environmental justice to fair housing and fair

²Other facilities in the area the Huntsman Petrochemical plant, Chevron Phillips plant, Great Lakes Carbon Corporation's petroleum facility, Total Petrochemicals USA facility, Veolia incinerator facility, and BASF Fina Petrochemicals plant.

treatment from FEMA. After Hurricanes Katrina and Rita, many people who left New Orleans landed in Houston. This was because, for many, “there was nothing to go back to.” Most recently, Hurricane Laura narrowly missed Port Arthur but hit the Lake Charles area. Kelley explained how he organized a group to help cut down trees and bring generators for people suffering from heat. “It’s not about how many people you help,” he stated, “it’s about doing what you can.”

Kelley pointed out that managed retreat is a tricky topic. Many people living in Port Arthur love their community, way of life, and culture. Kelley compared this to people who wanted to return to New Orleans after Katrina and whose “hearts were still in New Orleans, remembering when they had close-knit families and communities.” He stated there were many ways managed retreat could work, and that it could take many forms. For example, finding a way where those who want to leave can go together, but those who wish to stay can be assisted, at the federal level, to build more resiliently.

He recalled the time when a group of residents from the Montrose area of Port Arthur, which had received six to seven feet of water, came to his office after Hurricane Harvey. Whenever there was a situation with chronic unemployment or loss of houses or habitat, they require “guidance and leadership.” Kelley explained how sharing people’s stories helped draw attention to the matter. He told the workshop participants “if you don’t tell your story, no one will ever know you are hurting, or [that] your community is in need.”

COMMUNITY PERSPECTIVE: UNMET NEEDS IN PORT ARTHUR

Michelle Smith is the marketing director for CIDA and has been a resident of Port Arthur since 2012 when she moved back to live with her grandmother. Many African Americans on the west side have lived there for generations after initially going there looking for a better opportunity. Smith was not used to seeing pollution and felt alarmed when passing by refineries. She did not understand why that was allowed to happen, which is why she started working with CIDA to “help shine a spotlight on” the number of unmet needs in Port Arthur. In 2005, she was in Port Arthur when Hurricane Rita hit. After growing up in the Netherlands, it was the first time Smith had to think of leaving her home for safety, she remarked that “it was terrifying.” Coming back in 2012, she was still a little nervous, but happy to be back. Her home did not flood during Hurricane Harvey but everything around it was flooded. “It was heartbreaking and difficult to watch people losing everything, and they still wanted to stay,” she said. By living close to the refineries, her house value has been artificially depreciated because of industrial pollution. She estimated it would be at least four

times as much if it were located elsewhere. She does not want to live by the refineries but feels trapped because she cannot afford to relocate. Selling her house is not an option because no one would want to buy it, and with the current market value of her home, she does not know where she would go. She described the situation as a continuous spiral that many community members feel from which they will never recover.

As soon as hurricane season starts, she wonders: “am I going to have to leave again? Will my house be standing when I come back? Will I have to make repairs just to live there safely? What am I supposed to do? What do we do? What are we supposed to do?” The critical part, in her opinion, is that the government needs to look at the situation and not attach a financial value merely to the homes, because more is required to move safely. For example, after Hurricane Harvey, many homes that were not in the floodplain now are. These homes now require flood insurance, which many cannot afford. Her home has not flooded, but she lives a mile away from two industries that produce over a million barrels of oil daily, which concerns her. She said she is terrified whenever it starts raining and would like to move, but simultaneously, she does not want to move as she loves her community and does not want to leave the place she calls home.

COMMUNITY PERSPECTIVE: REBUILDING

Octavia Sanders, from the Montrose neighborhood on the west side of Port Arthur, shared her story about how Hurricane Harvey took her home away. She has lived in Montrose since she was two years old and has suffered multiple hurricanes. Hurricane Harvey was the worst; as the water rose she left for her sister’s house, which was on stilts. The water continued to rise overnight, trapping 13 of them in the house. A helicopter had to rescue them three at a time. She recalled holding her dog in a grocery bag and telling her sister “oh look, the water went to someone’s roof,” not realizing it was the house she had bought with her late husband. The water ruined everything she owned, including her two cars, and displaced her from her home for months. She did not have flood insurance and she wishes she could have had a conversation with the person who talked her out of flood insurance. Finally, they gave her a FEMA trailer to stay in, and her home was eventually rebuilt on six-foot stilts. She is glad she has insurance now, even though she struggles to pay for it because she lives in a flood-prone area.

She heard about and considered a buyout because she does not want to go through another storm. “I hate to live like that—to be scared.” When everybody else is dry, her community in Montrose often has water. Many people she knows do not want to go through this again. Some of the houses in Sanders’ neighborhood are worth very little—hers is only worth

about \$5,000—so she does not think many people can afford to relocate. She often sits on her porch until late at night because she feels safe in her community, which she does not believe she would be able to do elsewhere. Additionally, she pointed out that many people raise animals and garden, which they may not be allowed to do in other areas. “Buyout is like, y’all just get out with no solution—give us a solution!” Drainage is one possible solution, she noted. She said if there were another plan, some people would move, especially the younger people, but many older people are comfortable and do not want to leave. “It’s not that we aren’t tired of it, but what can we do? What can the government do?”

Smith asked Sanders what her threshold is for determining whether to stay or go and what would have to happen for her to move to a new place. Sanders replied that if the government made it possible for her to move today, she would not want to leave since she did not know where to go. However, if she had a place like Montrose, and the whole community went, then maybe she would go but would consider lifestyle, her age, and community culture. Edward LeDay and Hilton Kelley further explained that around 80 percent of Port Arthur floods, so there is nowhere to go within Port Arthur. In some places, the ditches cannot handle the water, so better pumps might help; LeDay noted that pumps are not upgraded to combat the flooding. Sanders also commented that if there were ever an industrial explosion nearby, she would “probably move” at that point.

COMMUNITY PERSPECTIVE: INDUSTRY IMPACTS

Pam Graham has lived on the west side of Port Arthur her entire life. She has witnessed how exposure to industrial chemicals has affected residents. After retiring in 2017, she spent more time at home and became more concerned about air pollution. She contacted Hilton Kelley to speak at a city council meeting about a fire at the local German Pellets plant that created smoke for months in Port Arthur. Graham said no one from German Pellets attended the meeting, “which showed me they didn’t think we were important.” Residents had no idea how long it was going to burn for or what health effects it could have, nor was direction provided for where residents could go or what they could do.

Graham does not want to move because she feels it will need to be cleaned up, sooner or later. Currently, the market value of homes is low and many people are “insurance poor” due to numerous types of insurance that are needed—flood, homeowner, windstorm and hail, life, as well as car. That is difficult for her on a fixed income. She has renovated her home a couple of times only to have to do it again after storms and, every time, she stated it had been a fight with the insurance companies. She does not know where she would go if she had to relocate. Graham has two lots and

stated that she would not get the value needed to move somewhere else with the same level of privacy and space. Instead, she prefers Port Arthur and the west side to be a clean environment for the people who would like to stay. However, she added that her kids would not remain. Graham noted that some people on the west side are very educated and reside there willingly. Many residents have retired and returned because living costs are cheaper, but “they pay the price.” When they put silos by the port she was never provided notice or an opportunity to give feedback, and now industrial entities are surrounding her community. She wants to ensure that these industries are safely operated without harmful emissions.

COMMUNITY PERSPECTIVE: A “GUMBO” OF PROBLEMS

Landry Patin was born and raised in Port Arthur. He described a “gumbo” of problems—a mixture of things that play into staying and leaving. One of his earliest memories was of a “road trip” that was an evacuation when the hurricane hit while his family was stuck in traffic. He said everyone in his community is worried all year, especially whenever it is rainy or windy since they have seen it flood outside of hurricane season. He feels the problems in Port Arthur should be addressed instead of placing them on the back burner.

He can trace his entire family history back to Port Arthur. He had never considered leaving until his father died due to a massive heart attack after being sick. He knows many who have experienced cancer, diabetes, and other health conditions. Patin does not want to leave because this is his home and community but, if he did, it would be because he knew it was detrimental to his life, and he worries about his chances of having cancer due to the pollution in the area.

Patin stated that everyone he knows is familiar with someone who has lost everything. He was not sure how to sum up “the feeling of loss that you feel” after a storm. No one who has had this happen and comes back feels comfortable again, especially when the “path of the problems that cause this hasn’t been addressed.” His community has given suggestions but nothing has changed. Many residents have shared stories with him about living in homes with mold because “they don’t have a choice.” The floods are horrible but the “in-between times are also horrible” as he awaits the next flood. He also questions how he would be able to know that another location would be safe.

COMMUNITY PERSPECTIVE: PROBLEMS TO ADDRESS

Tiffany Anderson has been back in Port Arthur for four years. She was not affected by recent hurricanes but her family members are still rebuild-

ing their homes. For example, she has an elderly neighbor living in only the front room of her four-bedroom house. She knows people whose walls and floors were torn down to the foundations and they cannot afford to finish rebuilding them. She felt like many would not be in this situation had they been given proper notice. She believes everybody needs more alerts (e.g., “it’s coming, here’s what to do,” “here’s your starter pack, this is where you go,” and transportation options). Too many people have died simply because they were unable to swim or did not have access to a car. Many problems need to be addressed which could save lives and put people in better situations. For example, drainage systems are a significant problem that needs to be fixed, echoing similar sentiments that other speakers shared.

Another example to help prepare the community that Anderson provided was educating residents on homeowners insurance; she said many people do not know what type of insurance works best for their situation. Therefore when a flood does happen, people do not know what to do afterward. She finished by mentioning that help is also needed for single elderly residents who do not have anyone to check on them before, during, and after an extreme weather event.

Q&A WITH COMMITTEE MEMBERS AND AUDIENCE

Managed Retreat Considerations

Michelle Smith asked participants if they felt there has been enough communication regarding relocation options (e.g., where you would go, how you would get there, and what a relocation package could offer). Hilton Kelley replied that he has heard of managed retreat, but in his eyes, it means retreating from a battle he has been fighting—one he has been fighting for at least 15 years—to try to maintain the way of life for his community. Now that storms are worsening, withdrawing would mean starting again without a community and the community’s history. Additionally, age plays a significant role in the ability and desire to go somewhere else. His family is all in Port Arthur; he questioned where they would go and how they would leave together. He did suggest that many may go somewhere else and be comfortable, however, he wants to find a way to deal with the current issues sustainably with the needed support to stay in place.

Marie Kelley, Hilton Kelley’s wife, shared their journey after Hurricane Harvey. They stayed in hotels and a trailer for two years while their home was uninhabitable due to mold. She said it was devastating to see her possessions floating in the water. After a certain amount of time, they had to pay rent to stay in the trailer, so once they had one room done along with the kitchen and a bathroom, they moved back into their home. Many

places that have never had extreme weather events are now experiencing them, and she stated that she would not go elsewhere if faced with similar adversities. If another hurricane tears their rebuilt home, she does not know what they will do, especially since they still face financial hardships that they will never recover from. Hilton Kelley agreed, adding that they made it through more robust and are now better prepared with two levels so they can be upstairs if needed. Hilton Kelley believes there is a need for carbon footprint reduction, which is “why I refuse to retreat.” Hilton Kelley noted that he has seen people unite the most during disasters. Yet, it would be good to build relationships outside disaster situations, regardless of race, ethnicity, or background.

Janice Barnes, the committee co-chair, asked if there is an active city-wide approach to managed retreat or if this is still emergent on a case-by-case basis. Hilton Kelley replied that there had been conversations about several streets (e.g., Montrose), but it has never been a citywide discussion. However, he stated that a conversation needs to be had across Port Arthur.

Other Considerations

Billy Kelley recalled when his brother, Hilton Kelley, started talking with people dealing with health issues, such as children on breathing machines and residents dying from cancer. Billy Kelley said he did not realize how serious it was and how it affected children until then. He said, “if someone shoots you, you didn’t just die; you were murdered.” In his mind, it is the same thing with harmful industrial emissions. Before Hurricane Rita hit, this was a big concern for him since he lives three blocks from the refinery. When Hurricane Rita hit, he assumed it would be easy to handle by just getting in a car and leaving, but it was bumper-to-bumper cars on the road. He decided not to leave during Hurricane Harvey, which was a terrifying experience. Preparation for every storm is different, but to him, the “main thing is *how* are you going and *where* are you going.” He gave an example of now traveling with a chainsaw to cut through debris that could be in the roadway because of one time getting blocked by a fallen tree.

Next, Craig Colten asked if there had been any compound impacts from flooding (e.g., refinery spills and flooding). Hilton Kelley replied that he had seen aerial shots of the oil sheen in the floodwaters in Port Arthur, and some oil had been washed into the community from the refineries. Graham was unaware of a contingency plan to address possible chemical runoff from nearby industries. Hilton Kelley also noted that the inherent dangers in the water after a storm are often forgotten, such as alligators, poisonous snakes, and downed power lines.

Communication and Education Options

Colten inquired about communication and education options for recovery information. Sanders and Smith suggested that local government officials sharing information on the local news (both in the newspaper and on television) would be the best channel to reach people about repair programs for their homes, managed retreat options, and relocation eligibility information. However, Hilton Kelley highlighted that it would have to be outside Port Arthur due to flooding in most of the area. Several participants noted that after floodwaters recede, industries come back online and release additional emissions in West Port Arthur. Graham would like monitors installed for residents to monitor emissions. Smith noted that the startup, shutdown, and malfunction rule³ is important, since after industries start back up after a hurricane, they burn off large amounts of carcinogens, which “adds on to what they are already dealing with” after a flood. Hilton Kelley noted that startup and shutdown levels are not currently counted, but under new rules, companies may be required to find ways to reduce start-up and shutdown levels, which are “often used by companies to burn off extra stuff, too.”

Leaving

E. Barrett Ristroph, a committee member, asked participants if they would be willing to leave if there were a place with similar community amenities and features paid for and the community came with. Some participants indicated they would go, but there was a general agreement that they would only leave if others left with them, while others expressed they would not consider leaving. Hilton Kelley pointed out that evacuation routes can be dangerous. He shared seeing many people stuck on the side of the road with all their belongings because they cannot go on due to emptied gas stations and grocery stores. Issues like domestic violence, mental health issues, substance abuse, high crime levels, and financial concerns have also been seen by Kelley. He voiced support for a measure such as pre-prepared temporary housing for people impacted by a natural disaster until their homes are rebuilt.

KEY INSIGHTS FROM THE WORKSHOP

Colten observed that the discussions converged into several main themes, which can be summarized, in no particular order, as follows:

³For details about the 2015 EPA rule see <https://www.epa.gov/air-quality-implementation-plans/emissions-during-periods-startup-shutdown-malfunction>

- **Leadership and transparency:** Participants expect responsive and effective leadership from civic authorities, such as providing adequate warning of impending flooding conditions and timely notification for evacuation. They expect transparency from the industry to communicate and share information such as warnings about chemical releases and spills and news of expansion plans that might contribute to hazardous material releases and storm runoff from the plant properties.
- **Information on options:** Participants requested more timely information on safe evacuation routes and welcoming evacuation destinations during hurricanes. If there is to be relocation, they want information about possible destinations and what makes them better than their current residences.
- **Follow-through:** Participants expect the local, state, and federal officials to follow through on commitments to provide safety during disasters and efficient recovery after a disaster. This desire includes sustaining programs until they are fully completed and funding beyond one administration.
- **Risks on the rise:** Participants noted that hurricane, sea-level rise, precipitation, and flood risks are rising due to climate change and sea-level rise, elevating their risk of flooding. They also commented that chemical emission risks were on the rise. They want to be informed about the possible threats and have information delivered promptly.
- **Protracted recovery process:** Participants voiced frustration with the time required to roll out recovery plans and deliver government relief and private sector insurance funds. The lag between property damage and receipt of funds created hardships for many participants for extended periods.
- **Market value for property:** In terms of buyouts, the participants were critical of the valuation of properties that only considered the dollar value and not the host of social and cultural values of residing in a friendly community and noted damaged parcels in the shadow of industries will not yield sufficient equity to buy comparable housing elsewhere.
- **Attachment to place:** Participants who would rather stay than leave repeatedly expressed strong ties to place and community. The many unknowns of relocating to a new place tended to outweigh the rising risk of flooding, particularly for older residents. They placed more emphasis on flood mitigation procedures—such as drainage and pumps—as a solution to their situation rather than managed retreat.
- **Inequities in the process:** The participants were African Americans and pointed out numerous inequities regarding public services such

as adequate drainage and timely disaster relief. They voiced concern that relocation plans might merely remove people of color from gentrification and allow new development at their expense, pricing them out of their homes.

PREPUBLICATION COPY—Uncorrected Proofs

Copyright National Academy of Sciences. All rights reserved.

Appendix A

Public Workshop Agendas

BUYOUTS AND OTHER FORMS OF STRATEGIC RELOCATION IN GREATER HOUSTON

12400 Greenspoint Drive
North Houston

JUNE 8, 2022
ALL TIMES IN CDT

Objectives

- Hear from residents, local officials, and other experts about buyouts and other forms of strategic relocation in the Greater Houston area.
- Learn about and discuss issues relating to mandatory and voluntary buyout programs, local decision-making, and public engagement.
- Learn about and discuss the implications of equity on displacement and relocation.

10:00–10:10 am **Welcome and Introduction to the Study**
Dr. Chandra L. Middleton, Study Co-Director and
Program Officer, National Academies of Sciences,
Engineering, and Medicine
John Ben Soileau, Study Co-Director and Program
Officer, National Academies

- Dr. Lynn Goldman, Committee Member, Dean of
the Milken Institute of Public Health at George
Washington University
- 10:10–10:15 **Welcome from the Sponsor: The Gulf Research Program**
Dr. Lauren Alexander Augustine, Executive Director,
The Gulf Research Program at the National
Academies
- 10:15–11:30 **Community Testimonials: Buyouts and other forms of
Strategic Relocation in Greater Houston**
Facilitator: Ms. Cleo Johnson McLaughlin, President,
Black United Fund of Texas
Darnell Ozenne, Black United Fund of Texas
Marcus Glenn, Black United Fund of Texas
Kevin McKinney, Flood Victims of Richwood
Barbara McEntyre, Coalition for Environment, Equity,
and Resilience
Marcial Sanchez, Coalition for Environment, Equity,
and Resilience
Perla Garcia, Coalition for Environment, Equity, and
Resilience
- 11:30–12:00 **Discussion and Q&A with Community Testimonial
Panelists**
Moderator: Ms. Cleo Johnson McLaughlin, President,
Black United Fund of Texas
- 12:00–1:00 Lunch Break
- 1:00–2:10 **Panel 1: Challenges, Opportunities, and Lessons
Learned from Buyout Programs and Houston as a
Receiving Community**
Moderator: Dr. E. Barrett Ristroph, Committee
Member, Principal and Founder, Ristroph Law,
Planning and Research
Ray Beltran, M.P.S, Community Engagement
Coordinator, Harris County, Precinct 1
Ryan Slattery, Senior Advisor of Sustainability and
Resilience, Houston Mayor’s Office
Dr. Shannon Van Zandt, Professor, Landscape
Architecture and Urban Planning, Texas A&M
University at College Station

Shirley Ronquillo, Co-Founder and Community
Activist, Houston Department of Transformation

Q&A with Committee Members and Audience

2:10–3:35

**Panel 2: Implications of Inequity for Displacement,
Health, and Community Wellbeing**

Moderator: Dr. Lynn Goldman, Committee Member,
Dean of the Milken Institute of Public Health at
George Washington University

Deborah January-Beavers, JD, President and CEO,
Houston Wilderness

Susan Rogers, Associate Professor and Director of the
Community Design Resource Center University of
Houston College of Architecture

Elizabeth Van Horn & Carolyn White, Urban Planners,
Harris County Public Health

Andrew Rumbach, Associate Professor of Landscape
Architecture and Urban Planning, Texas A&M
University at College Station

Q&A with Committee Members and Audience

3:35–3:45pm

Summary and Closing Remarks

Dr. Lynn Goldman, Committee Member, Dean of
the Milken Institute of Public Health at George
Washington University

**STRATEGIC RELOCATION AND ENVIRONMENTAL PERCEPTION:
COMMUNITY PERSPECTIVES FROM PORT ARTHUR, TEXAS**

Golden Triangle Empowerment Center
617 Proctor Street

JUNE 9, 2022
ALL TIMES IN CDT

Objectives

- Hear from residents and local leaders about perceptions of environmental risks and hazards.
- Learn about and discuss forms of strategic relocation under consideration, including issues relating to local decision-making processes and public engagement in this context.

PREPUBLICATION COPY—Uncorrected Proofs

- Learn about and discuss the implications of equity for displacement and relocation.

5:45–6:00	Welcome and Introduction to the Study Dr. Chandra L. Middleton, Study Co-Director and Program Officer, National Academies John Ben Soileau, Study Co-Director and Program Officer, National Academies
6:00–6:20	Keynote Speaker: Mr. Hilton Kelley Founder and Director, Community In-Power and Development Association Inc.
6:20–7:40	Community Testimonials Facilitated by Community In-Power and Development Association Inc.
7:40–8:15	Community Discussion and Q&A with Committee Moderator: Dr. Craig Colten, Professor Emeritus, Louisiana State University
8:15–8:30	Summary and Closing Remarks Dr. Craig Colten, Professor Emeritus, Louisiana State University
8:30 pm	Adjourn

Appendix B

Participant Biographies

Tiffany Anderson (Speaker) is a U.S. Army veteran who currently works at Motiva in Port Arthur and is an independent business owner, who is local to the West Side neighborhood of Port Arthur. Anderson grew up in Port Arthur and moved back in 2019.

Kayode O. Atoba (Committee Member) is an associate research scientist at the Institute for a Disaster Resilient Texas at Texas A&M University. His research draws on the broader theory of urban planning and hazard resiliency to propose the best mitigation and adaptation strategies using quantitative and geospatial methodologies to identify the interactions between the built environment and natural hazards. His recent work addresses issues related to property acquisition and buyouts as non-structural mitigation strategies to reduce flood hazard impacts. He is a mentor and an alumnus of the William Averette Anderson Fund, the first interdisciplinary organization in the United States focused on increasing the number of underrepresented persons in the field of disaster research and planning. He participated in an expert workshop that was one source for Property Buyouts Can Be an Effective Solution for Flood-Prone Communities: Improved federal policy on funding and planning would deliver better long-term outcomes (Pew Charitable Trusts, 2022). He has a Ph.D. in urban and regional science from Texas A&M University, College Station, and an M.S. in geographic information systems from Sam Houston State University.

Lauren Alexander Augustine (Committee Member) is the executive director of the Gulf Research Program, which oversees all aspects of management

and use of the criminal settlement funds from the *Deepwater Horizon*. This includes fulfilling the vision, defining the strategic direction, and leading the development and implementation of this multi-dimensional, science-based program. She has served on the World Economic Forum's Global Agenda Council on Risk and Resilience; was a member of the Advisory Board for the American Geophysical Union's Thriving Earth Exchange program; and was a juror for two resilience competitions, Rebuild by Design for recovery after Hurricane Sandy and Resilience by Design in San Francisco. Augustine has a B.S. in applied mathematics and systems engineering and an M.S. in environmental planning and policy from the University of Virginia, and her Ph.D. in an interdisciplinary program that combined physical hydrology, geomorphology, and ecology from Harvard University.

Janice Barnes (Committee Co-Chair) is the founding and managing partner of Climate Adaptation Partners, a NYC-based woman-owned business that focuses on planning, advocacy, and partnership-building for climate adaptation. She is a member of the Resilient America Roundtable, a co-chair of the New York State Energy Research and Development Authority Climate Impact Assessment Health and Safety Technical Working Group, a co-chair of the Health Working Group of New York City Panel on Climate Change, a lead author for the upcoming UCCRN ARC 3.3 as related to Climate Change, Cities and COVID-19, and on the faculty of University of Pennsylvania Perelman School of Medicine and Weitzman School of Design. She is an advisor to the Urban Land Institute Resilience team, the American Institute of Architects National Resilience Advisory Group, the US Technical Advisory Group for ISO TC59 on Buildings and Civil Engineering Works, and the Florida Institute for Built Environment Resilience. She holds a Ph.D. in architecture/organizational behavior and an M.S. in architecture from the University of Michigan, as well as a M.Arch. from Tulane University.

Gary S. Belkin (Committee Member) is a visiting scientist at Harvard University T.H. Chan School of Public Health and the founder and president of the Billion Minds Institute, which brings science and policy to bear on tackling the “social climate” crisis of the climate crisis. He works with municipalities—in the US and globally—to innovate methods for population community mental health and resilience in ways that advance other social and human capital aims and outcomes and that shifting knowledge, skills, and implementation tools to community members. He has served on numerous advisory boards, led large health and human service systems, including as medical director for behavioral health across the NYC Health and Hospitals Corporation, and is the founding editor of the journal *Global Mental Health*. He was formerly executive deputy commissioner for the

New York City Department of Health and Mental Hygiene. He holds a Ph.D. in the history of medicine from Harvard University, and an M.D. from Brown University Alpert School of Medicine and completed a residency in psychiatry at Massachusetts General Hospital, Harvard Medical School.

Ray Beltran (Speaker) community engagement coordinator for Harris County Precinct One, Commissioner Rodney Ellis. Beltran is a leading expert in creating and managing Voter Engagement and Voter Education programs for Houston area nonprofits and has previously worked as a contractor for campaigns all over the state of Texas. Through his work with Precinct One, Beltran has worked with government and NGO agencies to improve equity in the areas of flood mitigation/prevention projects, disaster relief, and flood relocation programs for Precinct One constituents. Beltran has a B.A. in political science from The University of Texas at El Paso and a M.P.S. in political management from George Washington University.

Debra M. Butler (Committee Member) is the Mellon Foundation curriculum development fellow at the Five College Consortium and has professional experience in financial markets and leadership development. Her primary research interests are climate displacement, migration, and resettlement on the Gulf Coast, and how tribal and communities of color employ cultural resources and indigenous knowledge to mitigate structural vulnerabilities and climate impacts. Her foci are communities in Louisiana, Alabama, Mississippi, and Sancti Spiritus, Cuba. She is a National Science Foundation Integrative Graduate Education and Research Traineeship fellow, a National Academies of Sciences Gulf Research Science Policy fellow, and a Harte Research Institute Furgason fellow. She also holds certification from the Institute for Tribal Environmental Professionals and the National Disaster Preparedness Center. She has an Ed.M. from Harvard, an M.B.A. from Brandeis University International Business School, and a Ph.D. in environmental studies from the School for the Environment at the University of Massachusetts.

Craig Colten (Committee Member) is professor emeritus at Louisiana State University. His principal training is in historical geography, with foci on human adaptation to environmental conditions and settlement geography. His recent research has focused on hazards and community resilience on the Gulf Coast, adaptation to environmental change, and environmental migration as an adaptive strategy. He is senior advisor at Water Institute of the Gulf, a fellow of the American Association of Geographers, and a recipient of the association's 2022 Gilbert White Distinguished Public Service Honor. Colten served as the chair of the Isle de Jean Charles Resettlement Project Academic Advisory Committee His most recent book is *State of Disaster: A*

Historical Geography of Louisiana's Land Loss Crisis. Colten has a Ph.D. in geography from Syracuse University.

Katherine J. Curtis (Committee Member) is professor of Community & Environmental Sociology and associate director of the Center for Demography and Ecology at the University of Wisconsin-Madison. Her work is centered in demography and extends to spatial, environmental, rural, and applied demography, and focuses on two central themes: population-environment interactions, most centrally the relationship between demographic, economic, and environmental forces; and spatial and temporal dimensions of social and economic inequality, most centrally historical and local forces perpetuating racial disparities. In her work, Curtis adopts place-based theoretical frameworks and employs advanced spatial and spatiotemporal statistical approaches to analyze questions about inequality, which has profound and far-reaching impacts on population wellbeing. She earned a Ph.D. in sociology at the University of Washington.

Harriet Festing (Committee Member) is co-founder and executive director of the Anthropocene Alliance (A2), a Florida-based nonprofit that combats climate change and environmental abuse by building grassroots coalitions in the communities most affected by flooding, toxic waste, wildfires, drought, and heat. A2 has more than 100 member communities in 35 U.S. states and territories. Before founding A2, Harriet worked for the Center for Neighborhood Technology in Chicago where she undertook ground-breaking research on urban flooding in the U.S. Her work with A2 advances community transformation by building grassroots coalitions in the communities most badly affected by climate change, including current work in Port Arthur, Texas, helping community leaders to survey their residents to see what climate migration might look like for this community. She has an M.Phil. in business economics from the University of London.

Teresa Davis (Speaker) successfully led a crisis counseling team throughout southeast Texas, overseeing nine counties and working closely with both state and federal stakeholders, in response to Hurricane Harvey. She focuses on advocacy, community engagement, resiliency, and restoration. She joined The Coalition for Environment, Equity, and Resilience, in 2019 to raise awareness of the connections between pollution, place, and the public's health, serving as director of Government Affairs & Community Engagement and now serves as the interim coalition director. Davis holds an M.A. in education psychology from Eastern Michigan University.

Perla Garcia (Speaker) has been a volunteer and community leader for the Houston Department of Transformation, Mi Familia Vota, and Texas

Organizing Project. After receiving letters at the beginning of the COVID-19 pandemic notifying her and her community that there was a buyout program affecting their homes, Garcia has been involved in working to find help and support for her predominantly Hispanic community.

Marcus Glenn (Speaker) has been active in Houston's food production community for the past decade with an emphasis on community-based agriculture job training to increase residents' economic opportunities and increase community resiliency. Currently, Glenn serves as the area manager for Houston ISD Nutrition Services Food and Agriculture Literacy Center, which has programs that teach students about where food comes from, how it gets to their plates, and how food can be nutritiously prepared.

Lynn Goldman (Committee Member) is a pediatrician and epidemiologist, is the Michael and Lori Milken Dean and professor of environmental and occupational health at George Washington University. She was previously a professor of environmental health sciences at John Hopkins University. She is a member of the National Academy of Medicine, a member of the NIH National Advisory Environmental Health Sciences Council, and a member of the National Academies Environmental Health Matters Initiative. Goldman is chair of the board for the Association of Schools and Programs of Public Health and a member of the CDC Advisory Committee to the Director. Goldman holds an M.D. from University of California, San Francisco; an M.P.H. from Johns Hopkins University; and a B.S. and M.S. from University of California, Berkeley.

Pamela Graham (Speaker) is a retired united postal service supervisor. She has lived in the Port Arthur West Side neighborhood for 40 years. She lives within a two-mile radius of the Valero refinery and has experienced numerous emission events and hurricanes. During Hurricane Harvey, her home was damaged due to flooding.

Deborah January-Bevers (Speaker) has been involved with public policy around the Greater Houston region and the State of Texas, serving as president and CEO of Houston Wilderness. She has been involved in the creation and implementation of a variety of regional environmental policy initiatives over the years, including the four-part Quality of Life Coalition agenda that included *Freeway Forestation* and the creation of the *Bayou Greenway Initiative*. At Houston Wilderness, she currently collaborates on the eight-county *Gulf-Houston Regional Conservation Plan* with three key goals for environmental resiliency, the 25-mile *Houston Ship Channel TREES Program* targeting one million new native trees on riparian corridors along the Houston Ship Channel by 2030, and *the Riverine Targeted-*

Use-of-Buyouts Program. January-Beyers is the lead author of *Houston Wilderness' Ecosystem Services Primer*. She has a B.A. from the University of Texas at Austin and a J.D. from the University of Houston

Cleo Glenn Johnson-McLaughlin (Speaker) worked in various low-income or disadvantaged communities fighting for human and civil rights. As president of the Black United Fund of Texas, she fought for equal access in the workplace and rebels against dependences and charity slavery. She advocates for elderly citizens with Alzheimer's and is a strong proponent for Veterans and community social change. She is a member of the Nigerians In the Diaspora Organization and is also collaborating with the Haitian community. Johnson-McLaughlin has been a community outreach specialist for the late Congressman Mickey Leland, co-campaign manager for Governor Mark White and Mayor Kathy Whitmire as well as currently serving as Mother of The District for District 139. Johnson-McLaughlin graduated from the Union Institute and University of Cincinnati in public administration and doing advanced studies in social work at Texas Southern University.

Hilton Kelley (Speaker) is the executive director & founder of Community In-Power and Development Association Inc. (CIDA Inc.), as well as a community organizer, activist, author, and United States Navy Veteran. As stated on their website (<https://www.cidainc.org/>), CIDA Inc. is a non-profit that works to empower residents in low-income communities in Port Arthur, Texas. Kelley founded CIDA Inc., as he was inspired to rebuild and revitalize his hometown; he “began to challenge the environmental violations of the plants that loom over the community he calls home.” Since Kelley started this fight, he has arranged for CIDA to join the international Shell Global Accountability Campaign, spoken at multiple Shell Annual Meetings, testified before the U.S. Senate on behalf of impoverished communities, and received multiple awards and honors, including the 2011 Goldman Environmental Prize and Presidential recognition.

Edward LeDay (Speaker) is a retired Drainage District 7 employee. LeDay has lived in the Montrose neighborhood of Port Arthur since 1967. After living in the neighborhood for over 55 years, LeDay has experienced numerous hurricanes and floods while living in Montrose. After Hurricane Harvey, he was forced to build a new home.

Barbara McEntyre (Speaker) is a realtor and property manager a resident of Cleveland, Texas, and the new executive director of the Liberty County Long Term Recovery Committee, She has volunteered with Liberty County Long Term Recovery (as an executive board chair and unmet

need chair) alongside other organizations for 17 years. McEntyre helped with Disaster Recovery following Hurricanes Katrina and Rita, Hurricane Ike, the 2015 and 2016 Floods, Hurricane Harvey, Tropical Storm Idema, and Texas Winter Storm Uri. She is very involved in recovery and communications regarding what is happening to residents in flood-prone areas and her work has met with GrantWorks on the best approach to residents in the buyout areas.

Kevin McKinney (Speaker) is the chairman of the Richwood Advisory Council, founder of Flood Victims Richwood, and a resident of Richwood, TX. He works with residents in the Southeast Gulf Coast Region of Texas concerning flooding and climate change and is attempting to work with municipalities to find solutions to these issues. McKinney continues to stand up for impacted communities by working with lawyers, experts, residents, and professional groups against corrupt government decisions concerning flooding, floodplain development, wetland destruction, and the diversion of flood waters into communities.

Darnell Ozenne (Speaker) is a native of Houston, Texas. Ozenne is very involved with his community through a local church—an activist-based organization called the Knights of Peter Claver—and has participated in Pleasantville Community Projects such as Pleasantville Civic League and Community Service. He also attended Texas Southern University.

Landry Patin (Speaker) is a sales representative for Pepsi and has lived in Port Arthur all of his life. He has had to evacuate many times due to hurricanes. With the constant looming risk of natural disasters and constant health impacts from nearby industry, he is considering leaving the place he has called home for over 30 years.

E. Barrett Ristroph (Committee Member) is the owner of Ristroph Law, Planning, and Research, which provides services to tribes, communities, and agencies related to natural resources, hazard mitigation, government, and climate change adaptation as well as relocation. She is a lawyer, planner, mediator, evaluator, and researcher based in south Louisiana and Alaska. Her work has included assisting Newtok Village, Alaska, with: relocating to Mertarvik, Alaska; establishing a climate change program for an Alaskan inter-tribal organization; assisting tribes with hazard mitigation and adaption planning; working with the National Oceanic and Atmospheric Administration on environmental review for Louisiana coastal restoration projects; and working on reports for international agreements related to environmental and human rights issues. She has a Ph.D. in adaptation planning and a J.D.

Susan Rogers (Speaker) is an associate professor of architecture at the University of Houston and the director of the Community Design Resource Center (CDRC). Her work is based on the disciplinary foundations of architecture and city planning with an expanded lens to directly engage questions of justice and equity. Under her direction, the CDRC has completed dozens of collaborative projects, initiated and supported through community partnerships. The projects focus on grounded and systemic change. Rogers holds an M.Arch. from the University of California, Berkeley, and a B.Arch. from the University of Houston.

Shirley Ronquillo (Speaker) has been a resident of East Aldine, Texas in Harris County since 1980. She is a community organizer while she is the administrator and co-founder of the Houston Department of Transformation, a resident-led organization with the mission to use civic engagement and tactical urbanism to create safe beautiful communities. Ronquillo assists families to navigate municipal decisions related to clean water and drainage issues, redistricting, home buyout programs, and language barriers, each of which can be critical to a family's quality of life. She has a B.A. in international studies and romance languages as well as a B.A. in French at the University of St. Thomas and an M.P.A. at the University of Texas–San Antonio.

Catherine L. Ross (Committee Member) is the regents' professor and Harry West professor of city and regional planning and civil and environmental engineering and director of the Center for Quality Growth and Regional Development at the Georgia Institute of Technology. Her extensive regional resilience and sustainability research focuses on water resources, energy, transportation, economic development, and Mobility-as-a-Service. Her work includes a multidisciplinary focus on resilience, analytics, transportation impact assessment, and performance management. She currently serves as chair of the board of directors of the Auto Club Group with the American Automobile Association. She recently joined the board of the Health Effects Institute, which focuses on the health effects of air pollution, including those caused by unconventional oil and gas development. She holds a Ph.D. in city and regional planning from Cornell University.

Andrew Rumbach (Speaker) is an associate professor of landscape architecture and urban planning as well as a coordinator of the Master of Urban Planning Program at Texas A&M University. Rumbach is also a faculty fellow at the Hazard Reduction and Recovery Center. His research investigates the root causes of disaster and climate change risk in cities and towns, with a focus on how and why urban development processes—mediated by local government plans and policies—produce uneven geographies of risk

and resilience. He manages the Planning for Hazards: Land Use Solutions for Colorado project, a comprehensive resource for helping communities to build resilience through land use planning. He also leads a team of practitioners who deliver community-based training from the National Disaster Preparedness Training Center on hazard mitigation, disaster recovery, and planning for community resilience.

Marcial Sanchez (Speaker) has been a resident of the Allen Field community for 43 years. He is a retired homeowner and has been involved with a mandatory buyout program in his neighborhood, to which he received a letter in July 2020. He supports the Texas Organizing Project, which has been a voice for many residents involved in the mandatory buyout program.

Octavia (Beatrice) Sanders (Speaker) has lived in the Montrose neighborhood of Port Arthur since she was two years old. Despite repeated flooding and several severe hurricanes, she has stayed in her community. After watching Hurricane Harvey's floodwaters destroy her home she struggled for some time before she was able to get a new home built.

Tracie T. Sempier (Committee Co-Chair) is the coastal resilience engagement specialist for the Mississippi-Alabama Sea Grant Consortium. She works with local communities, state and federal agencies, non-profit organizations, businesses, coastal managers, residents, and K-12 audiences to decrease the negative effects of disasters (natural, technological, and biological) on families, communities, and the environment. She is also the VORTEX-SE engagement coordinator, for which she is creating a model for regional extension programming focused on severe weather, synthesizing research findings to inform application at the local level, and working to create safe sheltering options for vulnerable populations. She is the lead for the Gulf of Mexico Climate and Resilience Community of Practice. She earned a Ph.D. in curriculum and instruction from Mississippi State University, an M.S. in science and mathematics education at Oregon State University, and a B.S. in marine science and biology from the University of Alabama.

Ryan Slattery (Speaker) is an advisor in the Houston Mayor's Office of Recovery where he works to expedite federally funded disaster recovery projects to advance Resilient Houston and Houston's Climate Action Plan. A core responsibility of the Recovery Office is to ensure that Houston's recovery process is equitable, resilient, and sustainable. He works to solve the shocks and stresses that are commonplace for a coastal community. Before joining the Mayor's Office, Slattery was a program management and government relations consultant, working with federal, state, and local agencies across the United States helping to navigate the disaster recovery

process with a focus on future resilience. He holds a degree in architecture and design from both the University of Texas at Austin and the University of Houston.

Gavin P. Smith (Committee Member) is a professor in the Department of Landscape Architecture and Environmental Planning at North Carolina State University. His research focuses on hazard mitigation, disaster recovery, and climate change adaptation and the integration of research and practice through deep community engagement. His current research includes assessing the state of disaster resilient design education at U.S. Universities, the analysis of a national survey assessing the role of states in building the capacity of local governments to implement hazard mitigation grants, and a comparative assessment of hazard-prone housing acquisition programs in the U.S., New Zealand, and Australia. He has developed a graduate certificate program in disaster resilient policy, engineering, and design and is helping to coordinate a university-wide effort focused on disaster resilience spanning research, teaching, and engagement-related activities. He holds a Ph.D. in urban and regional planning from Texas A&M University

Michelle Smith (Speaker) has lived in the West Side neighborhood of Port Arthur for 10 years. She has experienced many hurricanes and has worked with the Community In-Power and Development Association Inc. and with the Anthropocene Alliance. The Anthropocene Alliance is a 35-state-wide non-profit that provides 125 different communities the organization support, scientific and technical guidance, as well as access to foundation and government funding to fight climate change. Each hurricane season, she fears losing her home.

Natalie Snider (Committee Member) is the associate vice president for climate-resilient coasts and watersheds for the Environmental Defense Fund. She works to ensure sound science and just decision-making is utilized to plan, implement, and adaptively manage projects and policies, with a focus on system dynamics to meet the challenges of climate change to coastal and riverine ecosystems and communities. She previously worked at Louisiana Coastal Protection and Restoration Authority, leading efforts on the Louisiana Coastal Master Plan and as the science director at the Coalition to Restore Coastal Louisiana. She is a Ph.D. candidate in marine and estuarine environmental sciences at the University of Maryland and holds an M.S. in oceanography and coastal sciences and a B.S. in wildlife and fisheries management, both from Louisiana State University.

Courtney S. Thomas Tobin (Committee Member) is an assistant professor in community health sciences at the Fielding School of Public Health and

a faculty associate of the Ralph J. Bunche Center for African American Studies at the University of California, Los Angeles. As a medical sociologist, she integrates traditional sociological theories with perspectives from public health, social psychology, medicine, and the biological sciences to examine the social, psychological, and biological (i.e., biopsychosocial) pathways that contribute to the health and longevity of Black Americans. Her research program makes conceptual and empirical contributions to three interrelated areas of inquiry: (1) psychosocial pathways to embodiment, including the interconnections between mental and physical health; (2) health risks and resources across the life course; and (3) racialized stress and coping processes among Black Americans. She was a UC President's postdoctoral fellow in public health and psychology before joining the faculty at UCLA. She holds a Ph.D. in sociology from Vanderbilt University and a B.S. in psychology from Xavier University of Louisiana.

Carolyn White (Speaker) is an urban planner with the Harris County Public Health and representative to the County Infrastructure Resilience Team, a multi-departmental, collaborative group developing a Flood Resilience Plan for 2050. Her work to date focuses on uplifting vulnerable communities and nature-based infrastructure needs. Before joining HCPH she was the conservation director at Memorial Park Conservancy and an environmental services program manager with the Harris County Flood Control District. Her environmental planning career started at Cardno-ENTRIX Environmental Consultants. White completed all four levels of Wildland Hydrology Natural Channel Design courses and is a Certified Ecological Restoration Practitioner and a Certified Professional in Erosion and Sediment Control. She has a B.A. degree in geology from Carleton College and an M.Arch. in landscape architecture from University of California, Berkeley.

Elizabeth Van Horn (Speaker) is an urban planner and public health analyst with Harris County Public Health. Her work focuses on addressing health and socioeconomic inequities through community engagement, planning, and partnership building. She is particularly interested in the intersection of health, housing, and climate impacts, and she focused on identifying policy tools that allow for neighborhood investment without displacement in Arizona. She holds a B.S. in biology from Trinity University and two master's degrees (sustainable solutions and urban and environmental planning) from Arizona State University.

Shannon Van Zandt (Speaker) is the executive associate dean of the School of Architecture at Texas A&M and a professor of landscape architecture and urban planning. Her research focuses on the intersection of affordable housing and disasters, emphasizing how development patterns and struc-

tural racism have placed our most vulnerable populations at greater risk of damage and subjected them to long or incomplete recoveries. She serves as a board member of Texas Housers, one of the nation's preeminent housing advocacy organizations, and is engaged with the American Planning Association's Hazard Mitigation and Disaster Recovery Planning Division, the National Low-Income Housing Coalition, and the National Institutes for Standards and Technology Center of Excellence for Community Resilience Planning.