The Centrality of Collaboration in Social Services for Sustainability and Communities

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Introduction

Stakeholder collaborations are being recognized as essential to sustaining the resilience of infrastructure-based services. These collaborations are diverse in terms of how and when they occur and who is involved, and the characteristics often depend upon the context and the extent and combination of stakeholders. Sustainable Development Goals (SDGs) provide an important foundation for stakeholder engagement and collaboration and were adopted in 2015 by the United Nations.[1] SDGs pose a particular challenge to collaboration given the multiplicity of interests and diversity of stakeholders that arise for many SDG issues. Collaboration is essential to achieving SDGs by enabling capacity building through education, communication (including risk communication), commitment, trust-building, and different kinds of active involvement to shape policies and outcomes. Stakeholder communities often confront a disorganized set of options that may not necessarily correspond to their interests when making decisions. Selecting effective collaboration mechanisms is often a prerequisite for participating in decisions. A framework is presented here that first identifies types of collaborations and then links them to a key collaboration objective, degree of control. Then examples of actions are presented in the matrix that combines types of collaborations and degree of control. The framework specifically focuses on infrastructure services and their relationship to natural and other hazards, relevant to one broader SDG: Sustainability and Communities. The Sustainability and Communities SDG is an important platform for stakeholder engagement since it indirectly encompasses many other SDGs. The hazards included pertain to weather and climate, earth movement, and accidents. Other hazards pose threats to infrastructure as well such as cyber-attacks and pandemics and the collaboration framework presented here is potentially applicable to these also. While collaboration theories, models and methods have been widely applied, applications supporting sustainable and resilient infrastructure in a hazard context seem to be relatively less explored.

Cases addressed in this paper emphasize challenges and opportunities in two disaster areas: (1) confronting heat reduction from energy production emissions through community-based wind as a renewable energy option and (2) mitigating impacts of flooding through immediate and long-term actions. The framework is used to promote sustainability through collaboration by averting, avoiding, and reducing risks in the two case areas transferrable to other hazards, geographic areas, and scales.

A wealth of case literature exists for the identification of collaborative processes in the two

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[1] United Nations *Transforming Our World: The 2030 Agenda for Sustainable Development* (New York, NY: United Nations, 2015).

study areas. Emission-based heat mitigation has been an ongoing platform for collaboration styles, especially given equity considerations. Heat emission reduction, drawn from the energy literature, e.g., solar and wind, has its own collaborative histories that differ from collaborations for atmospheric heat reduction technologies. Layzer developed an extensive case history for wind energy that incorporated stakeholder involvement and collaboration.[2] Flooding provides a different perspective on stakeholder engagement and collaboration given its many different scales and multiple forms.

The approach used here to identify types of collaboration proceeds in several stages. First, an extensive multi-disciplinary existing literature locally, nationally, and internationally is reviewed. This literature often identifies collaboration approaches based on meta-analyses and "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA).[3] PRISMA is common for systematizing literature reviews in many different disciplines.[4] In addition, conceptual and case-based literature that covers collaboration categories is used.[5] Theories of stakeholder engagement and collaboration are introduced from fields other than infrastructure services that provide cross-disciplinary applications for infrastructure. Second, the types of collaboration identified are related to or characterized in terms of degree of control. Then examples are provided for the combination of collaboration type and degree of control. Third, specific case studies in the two infrastructure areas identified above – wind energy and flood mitigation – are used to identify collaborations in more detail, how they have been applied, and evolve over time.

Types of Collaborations and Their Characteristics

Types of stakeholders and the nature of their collaborations are extensive. They are often not static over time and adapt to the interactions and changes in extreme event conditions. Types of collaboration mechanisms were developed in the urban planning literature by Arnstein consisting of three broad categories for participation: non-participation, tokenism, and citizen power.[6] According to Arnstein, the first level takes forms such as attendance and observation with no discernible active engagement, where outside entities might be using participation to influence people's behavior, or is characterized by a unidirectional flow of information with little interaction or exchange. Arnstein's second level, "tokenism" is exemplified by "informing," "consultation" and "placation" often for the purpose of exerting influence, and the third level is more of a two-way exchange through partnering, and delegation of power and control. Furthermore, placing community appointed ombudsmen or watchmen at points at which action is occurring is a way to introduce community representation. The Arnstein typology was expanded by others to include more

[2] Judith A. Layzer, Chapter 13, "Cape Wind," in *The Environmental Case*. (Thousand Oaks, CA: CQ Press, Sage Publications, Inc., 2016), 421-462.
[3] Mario Ianniello, Silvia Iacuzzi, Paolo Fedele and Luca Brusati, "Obstacles and solutions on the ladder of citizen participation: a systematic review" *Public Management Review*, 21(1), 2019: 21-46.
[4] Rose E O'Dea, Malgorzata Lagisz, Michael D Jennions, Julia Koricheva, Daniel W A Noble, Timothy H Parker, Jessica Gurevitch, Matthew J Page, Gavin Stewart, David Moher, and Shinichi Nakagawa, "Preferred reporting items for systematic reviews and meta-analyses in ecology and evolutionary biology: a PRISMA extension" *Biological Reviews*, 96, 2021: 1695–1722. doi: 10.1111/brv.12721.
[5] For example, Sherry R. Arnstein, "A Ladder of Citizen Participation" *Journal of the American Institute of Planners* 35(4), 1969: 216–224, doi:10.1080/01944366908977225
[6] Sherry R. Arnstein, "A Ladder of Citizen Participation": 26.

detail about collaboration mechanisms and the foundations for supporting such collaborations. In Layzer's Cape Wind case, for example, public engagement approaches mentioned early in the process included "joint fact-finding," ownership (such as "a community-owned enterprise"), and comprehensive planning for site identification and legal access.[7] Related to this, ownership and empowerment have been put forth as "resilience hubs" in the context of community services that include some infrastructure such as energy, waters supplies and transportation.[8] Others have added details about the co-production of knowledge which is considered essential for involvement. Co-production often focuses on specific sectors of stakeholders such as academicians and "lay researchers" going beyond simply integration of knowledge to "working together."[9] Community-based participatory research (CBPR) in the health field transformed earlier public participation concepts of the late 1960s by focusing on extensive engagement and collaborative approaches among researchers and communities.[10] CBPR emerged around the mid-2000s to support collaborations between "scientific researchers and community members" for the investigation of health disparities.[11] Prior to that "Participatory Action Research" of the 1960s was used by a broader range of disciplines, and earlier still was action research ascribed to Kurt Lewin in the mid-1940s on the use of research for social change in a collaborative setting.[12] CBPR has transferability to other disciplines.[13] Stronger engagement mechanisms that involve empowerment, activism and protest also emerged that were aimed at infrastructure some of which resulted in the actual removal of infrastructure, for example, for roadways and dams.[14]

Grouping of Types of Collaborations by Purpose

Collaborative mechanisms can be grouped in different ways. One way is by purpose, for example, for knowledge generation, resource utilization, design, evaluation, and policy and outcome changes. Another way is in terms of degree of control. A third way is cross-

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[7] Layzer, "Cape Wind," 451-453.

[8] Kristin Baja, "Resilience Hubs: Shifting Power to Communities and Increasing Community Capacity" (Urban Sustainability Directors Network, 2018). Retrieved from https://www.usdn.org/uploads/cms/documents/usdn_resiliencehubs_2018.pdf.

[9] Marilena von Köppen, Susanne Kümpers & Daphne Hahn, "Co-Production of Knowledge and Dialogue: A Reflective Analysis of the Space Between Academic and Lay Co-Researchers in the Early Stages of the Research Process" *Forum Qualitative Social Research* 23(1), Art. 3 January 2022.; see other references contained within this article.

[10] Nina Wallerstein, Bonnie Duran, John Oetzel, Meredith Minkler, eds. *Community-Based Participatory Research for Health: Advancing Social and Health Equity*. 3rd ed. (San Francisco, CA: Jossey-Bass, 2018).

[11] National Institute on Minority Health and Health Disparities, U.S. Department of Health & Human Services, "Community-Based Participatory Research Program (CBPR)" Updated October 2, 2018.

[12] Bernard Burnes and David Bargal, "Introduction: Kurt Lewin: 70 Years On" Journal of Change Management 17 (2), 2017, DOI: 10.1080/14697017.2017.1299371

[13] Nina Wallerstein, Bonnie Duran, John Oetzel, Meredith Minkler, eds. *Community-Based Participatory Research for Health*.

[14] Nadja Popovich, Josh Williams, and Denise Lu, "Can Removing Highways Fix America's Cities?" *New York Times*, May 27, 2021; American Rivers Free Rivers: The State of Dam Removal in the United States (American Rivers, February 2022).

cutting, ranging from passive to active and even adversarial action. Table 1 provides a framework combining all of these approaches, first linking collaborative mechanisms scaled by level of action to degree of control, then adding purposes within the two dimensions. It is applicable across all stages of project development from problem identification through solutions and their implementation. The purpose here is to provide insights for the two cases with the potential to extend to other areas as well.

Table 1 Illustrative Generic Types of Collaboration, Level of Activity and Degree of Control

	Collaboration Type*	Objective: Degree of Control	
Activity		Low or Moderate	High or Extreme
Active	Protest; Adversarial action	Occupy movement; demonstrations	Infrastructure removal: e.g. roads, dams (nt. 13)
	Activism; traditional legal mechanisms	Litigation for regulatory change; financial appeal	Petitioning, advocacy; punitive measures
	Empowerment	Development of “Resilience Hubs”	Hub Ownership
	Public assembly	Sit-ins	Blockage of unwanted activity
	Capacity building	Resource commitments from sponsors	Stakeholder generated resources; data exchange
	Co-Production	Citizen science monitoring as inputs to scientific databases	Stakeholder definition of knowledge components and analytical protocols
	Agreements	MOUs, contracts, compensation	Binding agreements; sanctions
	Community-based participatory research (CBPR)	Various applications, initially from health fields	Information ownership
	Ombudsmen	Representatives placed at facilities	Public gatekeepers
	Education and training	Formal institutional learning	Shaping and selecting curricula
	Communication including risk communication	One-way communication Dissemination	Two-way and multiple path communication
	Information provision; attention getting	Traditional public participation and hearing attendance	Project stakeholders (proponents, opponents) provide information
Passive	Sponsor/manager information requests	Public opinion polls; input of opinions, facts	Inputs into survey data from focus groups

*Drawn from general stakeholder literature references cited throughout the paper (e.g., Arnstein; Baja; Wallerstein et al; von Köppen et al and case literature).

Illustrative Cases

<u>Heat Mitigation Through Renewable Energy: the Case of Wind Energy</u>

Heat has been identified as a factor in many climate-related conditions such as ice melt which in turn can lead to sea level rise and flooding; ocean and atmospheric changes that contribute to severe storms; droughts; fires; direct effects on public health; and ecosystem impacts.[15] Heat, in the form of increasing atmospheric temperatures is considered a direct consequence of carbon and other greenhouse gas emissions.[16] Many adaptations exist that engage stakeholders, yet important mitigation measures for the use of heat reducing renewable energy sources also engage stakeholders. Stakeholder involvement has targeted these mitigation measures directly for example, in the Cape Wind case, in contrast to stakeholder intervention at other points along the heat-drought-fire cycle.[17]

Wind energy is considered one of the most viable sources of renewable energy for reducing heat from energy production emissions, at least indirectly by providing an alternative to the climatic conditions from non-renewable energy that contributes to increasing temperatures. The placement of wind turbines in coastal waters (offshore) has attracted stakeholder interests, actions and priorities varying over place and time. Gross identified a wide range of factors underlying public opposition to wind energy in general including size of facilities and land and property value impacts of transmission.[18] According to U.S. Energy Information Administration data, wind energy has increased dramatically between 1990 and 2021, from 6 billion kilowatt hours (kWh) to about 380billion kWh between 2000 and 2021 alone, and at the end of the period wind energy accounted for 9.2% of U.S. electricity generation, largely attributed to heavy government subsidies.[19] In the U.S. these are primarily onshore, with offshore sites under development, however, the first offshore wind facility in the U.S. is considered to be on Block Island in Rhode Island, and had considerable public support.[20] Issues surrounding wind power are financial and technological which shape public stakeholder debates. Such financial support has been intermittent and unstable.[21] The Infrastructure Investment and Jobs Act of 2022 provides substantial support for wind energy.[22] At broader, global levels the public tends to favor wind and solar power expansion, though local support often differs from that. Globally, Pew notes in 2021 77% of their survey respondents favored wind expansion and 84% favored solar expansion, however these percentages

[15] Sarah Derouin, "Simultaneous Drought and Heat Wave Events Are Becoming More Common" *EOS*, 2 February 2021.

[16] See the UN Intergovernmental Panel on Climate Change reports at https//www.ipcc.ch

[17] Gabrielle Canon, "Heat, drought and fire: how climate dangers combine for a catastrophic 'perfect storm'" *The Guardian* August 10, 2021; Sarah Derouin "Simultaneous Drought and Heat Wave Events Are Becoming More Common"; R. Fu, A. Hoell, J. Mankin, A. Sheffield and I. Simpson, "Tackling Challenges of a Drier, Hotter, More Fire-Prone Future" *EOS*, April 1, 2021.

[18] Samantha Gross Renewables, Land Use and Local Opposition in the U.S. (Washington, DC: The Brookings Institution, 2020).

[19] United States Energy Information Administration "Electricity Generation from Wind" (Washington, DC: U.S. EIA March 30 2022). Source cited: U.S. Energy Information Administration, *Electric Power Monthly*, February 2022, preliminary data for 2021 Note: Utility-scale electricity generation.

[20] Warren Leon, Block Island Offshore Wind Farm Set the Stage for Further Clean Energy Development (Montpelier, VT Clean Energy Group, 2018). https://www.cleanegroup.org/block-island-offshore-wind-farm-set-the-stage-for-further-clean-energy-development/.

[21] Layzer, "Cape Wind," 423.

[22] P.L. 117-169 the Inflation Reduction Act of 2022 (August 16, 2022); Congressional Research Service, Offshore Wind Provisions in the Inflation Reduction Act (Washington, DC: CRS, September 29, 2022). https://crsreports.congress.gov/product/pdf/IN/IN11980.

represented a decline from 2020 when the percentages for wind and solar were 83% and 90% respectively.[23] Layzer also notes the popularity of these alternative energy sources globally and the disconnect with locally-based siting opinions.[24] Numerous local polls, for example, produced lower percentages in favor of the specific Cape Wind project.[25] The opponents struggled with broadly defined benefits of wind power and negative environmental, cultural, navigational, and property value impacts locally.[26] Proponents largely adopted a process of one way flow of information to the communities with less apparent interaction at least as implied in the case literature. The Corps of Engineers entered the issue as the entity responsible for preparing the environmental impact statement (EIS) which was later transferred to the Department of Interior and the government's mode of engagement was through public hearings with Congressional action entering the process.[27] In spite of the growth and popularity of wind energy generally, substantial controversy has existed over offshore facilities, exemplified by the Cape Wind project in Boston Harbor. Ultimately, the controversy was attributed to localized interests that prevailed based on visual or aesthetic impacts and property values over larger societal benefits of wind energy, and the shaping of decisions occurred around highly focused regulatory procedures.[28] The debates occurred through media, meetings and legislative action with both federal and state EIS processes and permits becoming the procedural focal point. Proponents were the Cape Wind Associates; other organizations joined in voicing their opinion about procedures such as the Cape Cod Commission; and opponents organized under the Alliance to Protect Nantucket Sound consisting of property owners and environmental organizations, though environmental organizations broke away shifting the importance of negative environmental impacts.[29]

Offshore wind and onshore wind seem to differ in stakeholder structure and engagement. Cost differentials are considerable with offshore facilities estimated at three times the cost of onshore facilities.[30] The Cape Wind case illustrates the prominence of location and technology issues, and the flexibility of proponents and opponents to adjust those two factors to address environmental, technological, and cultural issues that arose. In addition to stakeholder interaction illustrated by Cape Wind, the U.S. government has identified citizen science techniques for renewable infrastructure that include solar energy.[31]

<u>Flooding</u>

Flooding is a leading cause of morbidity and mortality as well as damages to the natural environment and the built environment, including vital infrastructure and the services it provides: The National Weather Service indicates that deaths from flooding are exceeded

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[23] Pew Research Center, "Gen Z, Millennials Stand Out for Climate Change Activism, Social Media Engagement with Issue" (Washington DC: Pew Research Center, May 20, 2021): 32.
[24] Layzer, "Cape Wind," 422.
[25] Layzer, "Cape Wind," 437.
[26] Layzer, "Cape Wind," 438.
[27] Layzer, "Cape Wind," 439, 440.
[28] Layzer, "Cape Wind," 422.
[29] Layzer, "Cape Wind," 442.
[30] Layzer, "Cape Wind," 423.
[31] U.S. General Services Administration, "Case Studies" CitizenScience.gov. (Washington, DC: GSA, Undated) https://www.citizenscience.gov/toolkit/case-study/#; https://www.citizenscience.gov/assets/files/openpv-solar-energy-data.pdf.

only by heat related deaths, and that the 30 year average for such deaths of 88, exceeds the averages for lightning, hurricanes and tornadoes; the interaction with infrastructure is substantial with about half of the deaths occurring during vehicle use.[32] The nature of stakeholder engagement and collaborative networks with respect to flooding vary widely according to the type of flooding and its effects. Understanding differences in types of flooding is a prerequisite to the design of collaborative processes, and flooding types generally include coastal, riverine, and non-waterbody related flooding such as drainage problems and flash flooding.[33] The causes of flooding include direct rainfall, groundwater expansion, runoff, ice jams, storm surge and increased snowmelt; the interaction with land surfaces is a critical dimension including poor drainage, soil capacity limits for holding water, soil instability, and performance of flood retarding structures.[34] Flooding also accompanies many other weather and climate related extremes, for example, hurricanes and geophysical phenomena such as tsunami generated by earthquakes. Massive damage to infrastructure has occurred from flooding with effects ranging from direct loss of life to infrastructure users to service interruptions affecting human lives in other ways.

The geographic extent of flooding varies widely. Flooding has occurred over entire river basins such as the Mississippi River floods of 1993 and thereafter in 2015 and 2019 for example.[35] Alternatively, flooding can be highly localized restricted to a single property or regions as in the mid-Atlantic and New England States during Hurricane Ida. Flooding can occur both above and below ground. The "Unification for Underground resilience Measures" project is focused on this problem specifically for underground infrastructure.[36]

Hurricane Ida resulted in numerous flooding-related deaths. 49 of the 55 direct deaths in the U.S. from Hurricane Ida occurred in the Mid-Atlantic and New England States, 48 of the 49 deaths were estimated by the National Weather Service (NWS) from freshwater flooding, and fourteen people died in their homes in NY, NJ and MD combined from flooded basements.[37] In part, according to NWS, this was due to inadequacies associated with the structures, illegal occupancy, and associated drainage infrastructure. Hurricane Ian of October 2022 experienced double the number of deaths in Hurricane Ida, concentrated in southeastern U.S.[38] The subway system in New York City, much of which is underground, has frequently flooded due to the configuration of its infrastructure which allows water to enter through grates and stairwells, and then it rolls through the tunnels to

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[32] NOAA National Weather Service, "Thunderstorm Hazards - Flash Floods" (Silver Spring, MD: NWS, NOAA, undated). https://www.weather.gov/jetstream/flood#:~:text=While%20the%20number%20of%20fatalities,tornadoes%20and%2045%20for%20hurricanes.

[33] Federal Emergency Management Agency (FEMA), U.S. Department of Homeland Security, "Flood/What" (Washington, DC: FEMA, undated).

[34] World Health Organization, "Floods," undated. https://www.who.int/health-topics/floods#tab=tab_1

[35] Rob Moore, "Midwest Floods of 2019 – the Latest Disaster to Learn From" (New York and Washington DC: Natural Resources Defense Council, March 21, 2019).

[36] SCC-CIVIC-FA Track B UNUM: Unification for Underground resilience Measures" (NSF # 2133356), wp.nyu.edu/unum/.

[37] NWS NOAA US Department of Commerce National Hurricane Center, "Tropical Cyclone Report Hurricane Ida" (Silver Spring, MD: NWS, April 4 2022): 12

[38] Mitch Smith, "Many of Hurricane Ian's Victims Were Older Adults Who Drowned," *New York Times*, October 7, 2022.

many points further on in the system, for example, which occurred in the 2007 severe rainstorm and flash flooding where water exceeded drainage capacities.[39] The MTA identified storms with similar impacts on the subway as having occurred a few years prior to the 2007 event.[40]

Some stakeholder engagement has emerged in flooding incidents in the form of active citizen involvement, for example, those described in the U.S. government Citizen Science cases.[41] These have included involving citizens in monitoring precipitation that can precede flooding and measuring soil moisture, and then entering the information into a common database.[42] Other stakeholder interactions have aimed at changes in government regulations especially in response to disasters that involved loss of life: regulatory actions, for example, as stakeholder advocacy actions were aimed at the use of living spaces, such as basement residences, vulnerable to flooding in Hurricane Ida.[43] Others involved systematic approaches that ranged from short term immediate response-related actions to longer term dramatic changes in the built environment and behavior. Shorter term, immediate actions are exemplified by operational measures such as barriers and pumping and evacuation and shelter-in-place measures accompanied by timely and effective communications for example identified in Hurricane Ian.[44] Longer term mitigative measures for flooding have related to much debated land use, permitting, structural design such as structural hardening and elevation, and the more extreme measures of relocation and retreat from areas prone to flooding common to both riverine and coastal flooding, which have been debated in many interactive stakeholder based collaborative settings.[45]

Conclusion

Mechanisms generally exist and are in place for stakeholder engagement for infrastructure services. The emphasis of such engagement for these services has primarily focused on technology, and people's knowledge and preferences and attention to problems that arise are important in shaping technological choices. Selected tools for planners and decision-makers have been presented to enable them to evaluate and design interactive collaborations to support sustainability at many different geographic scales. These address collaborative efforts for involvement in and interaction with the science and the creation of community bonds to support stakeholder engagement. The variety of collaborative mechanisms is extensive. Many of the initial forms identified earlier such as providing information, educating, communicating, establishing commitment and trust are important prerequisites for more active involvement and influencing policies and

[39] Metropolitan Transportation Authority, "August 8, 2007 Storm Report" (New York, NY: MTA September 20, 2007): 21.
[40] Metropolitan Transportation Authority: 14-16.
[41] U.S. General Services Administration, CitizenScience.gov.(Washington, DC: GSA, Undated).
[42] U.S. General Services Administration, "Case Studies" CitizenScience.gov. (Washington, DC: GSA, Undated) https://www.citizenscience.gov/toolkit/case-study/#.
[43] Lydia McMullen-Laird, "How to stop basement apartments from becoming "death traps" during flash floods" *The Gothamist*, September 13, 2021.
[44] Antonio Olivo, Derek Hawkins, Samuel Oakford and Scott Dance, "Hour-by-hour analysis shows toll of county's delay before Hurricane Ian" *Washington Post*, October 14, 2022.
[45] Elena Shao, "Three Ways to Build Back Smarter After Hurricane Ian*" New York Times*, October 3, 2022.

outcomes.[46] In the course of establishing such collaborations for infrastructure, it is important to keep in mind their applicability across many different components, i.e., infrastructure planning, design and operation and linkages among them, for greater resilience in the face of catastrophic events such as climate change and its potential for extreme heat and flooding illustrated here. These two case areas contrast in the type of stakeholder engagement given differences in the conditions the affected stakeholders confronted. For wind energy, more global concerns over the need for renewable energy confronted and often conflicted with more local concerns prior to construction decisions. For flooding, stakeholders focused on immediate prevention and response mechanisms to avoid death and destruction. Yet, in both cases stakeholders ultimately confronted complex technological options related to facility design, location, and their social impacts.

Outcomes for collaborations in the two cases also reflect both similarities and differences. Wind energy was largely debated in settings preceding actual construction whereas flooding debates occurred during and after a flooding event, though pre-event prevention was important. Stakeholders often take opposing stances on issues, for example, some stakeholders view facilities as aesthetically pleasing whereas others point to the obstruction of views. For property values, some point to devastating declines whereas others see a positive impact, and this contrast was reported in Ohio wind energy debates.[47] For flooding, stakeholder involvement has confronted often opposing options of evacuation or stay in place and messaging for both.[48] Technological options for the two cases varied in the short term as indicated earlier. For wind energy, distancing, reducing structure size, improving aesthetics, timing of operations to reduce noise, avoiding obtrusive transmission systems, and negative property values. For flooding, in contrast, water diversion, barriers, drainage operations, emergency warning systems for evacuation for immediate impact avoidance have been used. Longer term solutions also presented earlier tend to be similar for both cases where land use and population changes in the form of relocating impacted communities, retreat, and buy-outs by project sponsor stakeholders have been proposed. Regardless of the form of the debates, stakeholder initiatives have been a key aspect of infrastructure decisions.

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[46] Parrish Bergquist, Jennifer R. Marlon, Matthew H. Goldberg, Abel Gustafson, Seth A. Rosenthal & Anthony Leiserowitz, “Information about the human causes of global warming influences causal attribution, concern, and policy support related to global warming” *Thinking & Reasoning*, 2022: 465-486.
[47] Kris Maher, “Big Wind Project Sparks Bitter Debate in Rural Ohio” *Wall Street Journal*, September 25, 2022.
[48] Olivo et al. October 14, 2022.