TABLE 3. SAMPLE GOAL-BASED SOCIOECONOMIC METRICS FOR COASTAL RESTORATION PROJECTS

CLASS OF METRICS	FINAL METRIC (UNIT OF MEASUREMENT)	DATA COLLECTION METHODS	VALUATION METHODS OR TYPE OF ANALYSIS	USER CONSIDERATIONS
Community resilience — erosion	($) Difference in cost between hardened structure and a living shoreline	• Project budgets • Existing data sources	• Substitute cost method	Substitute cost method compares the construction and maintenance costs between two or more options (e.g., living shoreline versus a e.g., bulkhead), with the assumption that the equivalent level of functionality is provided by both options.
	(#) Cost-effectiveness of structure for shoreline stabilization (rate of erosion reduction per unit cost)	• Project budgets	• Cost-effectiveness analysis	A cost-effectiveness analysis for erosion reduction will include a combination of biophysical goal-based metrics and project costs. In addition to looking at rate of erosion reduction per cost, one could also look at cost-effectiveness for a wider range of goals achieved per unit cost, in which case a wider range of goal-based metrics would be needed.
	(#) Number of homes or structures benefitting	• Visual assessment • GIS Analysis	• NA	Identifying number of homes or structures benefiting from a restoration project is a non-monetary metric that that may be useful in the site selection phase of the project or in qualitatively describing how a project affects people. It could be accompanied by interviews with homeowners or focus group meetings or by information on the social vulnerability of households benefiting from the risk reduction or resilience project.
Community resilience — flooding	($) Change in damage costs to surrounding homes	• FEMA NFIP claim data when available • Surveys • Existing data sources	• Avoided cost method • HAZUS modeling	Obtaining Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP) claim data can be challenging. Municipal-level data is easier to obtain than parcel-level data. In some cases, researchers have been successful at submitting a Freedom of Information Act (FOIA) request to FEMA and receiving parcel-level data. If going this route, keep in mind it will take many months to obtain the data. Damage costs avoided can also be modeled using free software such as HAZUS, FEMA's Methodology for Estimating Potential Losses from Disasters.
	($) Change in damages to surrounding structures, roads or other public infrastructure	• Surveys or interviews • Data from municipality or county	• Avoided cost method • HAZUS modeling	Most likely, data on damage to public infrastructure will have to be obtained directly from the municipality (e.g., the public works department). Damage costs avoided can also be modeled using software such as HAZUS.
	($) Value of time saved by individuals driving on a road where flooding is reduced	• Surveys	• Avoided cost method	Surveys or focus group meetings may need to be accompanied with hydrological modeling to ascertain where flood reduction benefits are most likely to occur and by how much.
	(#) Changes in the number of days per month that road is flooded	• Surveys or focus group meetings	• NA	Surveys or focus group meetings may need to be accompanied with hydrological modeling to ascertain where flood reduction benefits are most likely to occur and by how much. Survey or focus group meetings can support the argument qualitatively that individuals are benefitting from the decrease in days per month that the road is flooded.
	(#) A decrease in number of days that businesses are closed after a storm or flood event	• Interviews	• NA	For this metric, one likely will want to target businesses in a particular sector or in a particular location, instead of including all businesses in the region.
	(#) Number of homes or structures benefitting	• GIS Analysis	• NA	Identifying number of homes or structures benefiting from a restoration project is a non-monetary metric that that may be useful in the site selection phase of the project or in qualitatively describing how a project affects people. It could be accompanied by interviews with homeowners or focus group meetings or by information on the social vulnerability of households benefiting from the risk reduction or resilience project.

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Community resilience — flooding	(#) Number of beneficiaries who benefit from a decrease in flood risk among socially vulnerable populations in a community	• Existing data sources • Use of online mapping portals	• NA	This metric involves two steps: 1) first identifying beneficiaries, and 2) doing an assessment of social vulnerability. Census-based demographic information can be obtained online for the vulnerability analysis. Mapping portals like Coastalresilience.org and NOAA's Sea Level Rise Viewer also provide vulnerability information. For a more comprehensive risk assessment incorporating future sea level rise, refer to Shepard et al. (2012).
Cultural values	($) Social value that individuals place on the resource	• Surveys • Existing data sources	• Contingent valuation or choice experiment • Benefit transfer	The social value individuals place on the resource (or habitat type) can come from a range of factors related to well-being, such as the cultural, historic or aesthetic value — or the value that individuals place on the continued existence of a resource for future generations.
	(#) Number of students benefiting from environmental education/research	• Surveys • Focus group meetings • Tracking with a log • Focus groups	• NA	It may be possible to coordinate with elementary schools, high schools, and/or universities to create a simple log to track number of students directly benefiting from the site through research or nature walks.
	Perceived quality of shellfish harvested (as an indicator of sense of place) (scale ranking 1 to 5)	• Focus groups	• Mixed methods analysis combining sense of place with cultural ecosystem service indicator approaches	Specific cultural values that are relevant are likely to vary by community — for instance, communities may value recreation or aesthetic attribute of the scenery. The focus groups allow the researcher to determine which cultural values are most important. Note that "quality" in this metric includes both size and abundance attributes as perceived by residents. For salt marsh and oyster reef restoration, the type of shellfish may be blue crabs, depending upon how the community ranks its cultural connection to shellfish harvesting. See Donatuto et al. (2014) for additional information on the methodology.
Economic development — commercial fishing	($) Change in revenues for commercial fisherman	• Surveys • Interviews • Existing data sources	• Partial budget analysis	A partial budget analysis looks only at the portion of the budget that will be changed by the change in resources — in this case, the increase in revenues from the increase in fish caught, while subtracting out the associated variable costs from the increase in fish harvested.
	(#) Change in number of commercial fish harvested	• Surveys • Existing data sources	• NA	Fisheries data available through the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service website.
	(#) Change in shellfisheries' closing days	• Existing data sources	• NA	Determine local agency responsible for tracking information on shellfisheries' closing days, such as a university, governmental agency or shellfisheries group for the industry.
Economic development — general	($) Regional economic impact of an industry or sector	• Surveys • Existing data sources	• IMPLAN or other regional economic modeling, such as input-output models	The IMPLAN (IMpact analysis for PLANning) input-output modeling software is used to assess the "ripple effects" or multiplier effects of an increase or decrease in spending. By modeling the interactions between every industry in an economy and tracking the flow of goods and services, one is able to estimate the total economic impact (jobs, income, sales) for the region in question.

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Economic development — general	(#) Number of new jobs created directly in the restoration activity	• Surveys • Interviews	• NA	The number of new jobs created will be relative to the size of the economy in that region. In densely populated areas, the number of new jobs created might have more weight if it is a large number, but keep in mind that for some rural areas, even a small number of new jobs created is considered important.
Economic development — tourism	($) Economic impact of ecotourism	• Surveys • Existing data sources	• IMPLAN or other regional economic modeling, such as input-output models	The IMPLAN (IMpact analysis for PLANning) input-output modeling software is used to assess the "ripple effects" or multi-plier effects of an increase or decrease in spending. By modeling the interactions between every industry in an economy and tracking the flow of goods and services, one is able to estimate the total economic impact (jobs, income, sales) for the region in question.
	($) Change in spending by birders	• Surveys • Existing data sources	• Economic impact assessment	Quantifying change of spending is a two-part process, where first the number of visitors before and after the restoration must be quantified, and then the average spending per visitor must be quantified. One should differentiate between spending by locals and spending by visitors from outside of the region; in order to consider the spending an economic impact, it must be from visitors from outside of the region.
	($) Change in spending by anglers	• Surveys • Existing data sources	• Economic impact assessment	Quantifying change of spending is a two-part process, where first the number of visitors before and after the restoration must be quantified, and then the average spending per visitor must be quantified. One should differentiate between spending by locals and spending by visitors from outside of the region; in order to consider the spending an economic impact, it must be from visitors from outside of the region.
	(#) Number of new jobs created in tourism-related industries	• Surveys • Interviews	• NA	The number of new jobs created will be relative to the size of the economy in that region. In densely populated areas, the number of new jobs created might have more weight if it is a large number, but keep in mind that for some rural areas, even a small number of new jobs created is considered important.
	(#) Number of new businesses	• Interviews	• NA	One would want to demonstrate that the restoration, at least in part, can be attributed to the opening of a new business (e.g., a restaurant or outfitter). While this metric should be considered qualitative, this type of metric can still be useful in building the case that a restoration project had a role in supporting local businesses.
Market value (e.g., payments for ecosystem services)	($) Market value of carbon credits (i.e., blue carbon)	• Existing data sources	• Market price	Blue carbon credits are not currently sold in the United States, though the potential exists for this market to develop in the future.
	($) Market value of water quality credits	• Existing data sources	• Market price	Water quality credits for oysters are not currently sold in New Jersey, though they are allowed in certain parts of the Chesapeake Bay.
Property values	($) Change in property value because of aesthetic improve-ments to view	• Existing data sources	• Hedonic valuation	There might be a lag time, if the restoration loses aesthetic appeal in the first two years post-restoration. This metric will only be relevant to certain projects and is more likely to be rele-vant in urbanized regions where open space is less abundant.

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Property values	$ Change in property value because of reduction in rate of erosion	• Existing data sources	• Hedonic valuation	For an example, see Gopalakrishnan et al. (2011). Although the focus was on beach erosion and dunes, the method will still be similar for erosion related to salt marshes.
	$ Change in property value because of decrease in flood risk	• Existing data sources	• Hedonic valuation	For an example, see Bin, Dumas, Poulter and Whitehead (2007). Although linked generally to sea level rise and not to a specific restoration project, the methods will still be similar.
	$ Change in municipal property taxes because of the change in property value	• Existing data sources	• Hedonic valuation	This metric requires two steps: 1) hedonic valuation, and 2) linking the changes in property values to changes in municipal property taxes collected.
Public Perception	Change in public aware-ness of living shorelines	• Surveys • Focus group meetings	• NA	Survey should include questions that seek to understand if residents (unprompted) list living shorelines when asked "Could you list the different types of shoreline stabilization projects (or techniques) that you know about?" This metric could also apply to public awareness of other restoration techniques.
	Change in political will or public support to living shorelines	• Surveys • Interviews		While the previous metric of "awareness" is solely based upon knowledge of living shorelines, this metric gets at a willingness to change behaviors and increase support for living shorelines. It is important to recognize that there are likely to be multiple groups advocating a change in political will toward living shorelines. This metric could also apply to other restoration techniques.
Recreation and public access (e.g., birding, fishing, swimming, etc.)	$ Value visitors to the site place on their experience	• Surveys • Existing data sources	• Contingent valuation or choice experiment • Benefit transfer	Note that value placed on the individual experience represents the *social value* of the visitor experience, or the value *beyond* the actual amount spent. This method of valuing public preferences is common when comparing policy alternatives to understand which policies have the largest benefit for the most people. Benefit transfer is a lower-cost option than contingent valuation. However, benefit transfer should only be used if the conditions and demographics of the initial study site are similar to the current restoration site. When possible, benefit function transfer and meta-analysis are more accurate than simple benefit transfer.
	$ Value boaters place on their experience	• Surveys • Existing data sources	• Contingent valuation or choice experiment • Benefit transfer	Note that value placed on the individual experience represents the *social value* of the visitor experience, or the value *beyond* the actual amount spent. This method of valuing public preferences is common when comparing policy alternatives to understand which policies have the largest benefit for the most people. Benefit transfer is a lower-cost option than contingent valuation. However, benefit transfer should only be used if the conditions and demographics of the initial study site are similar to the current restoration site. When possible, benefit function transfer and meta-analysis are more accurate than simple benefit transfer.
	# Number of visitors to the restoration site	• Car counter • Surveys • Geospatially referenced social media methodology	• NA	This is a common non-monetary metric that can be applied at a relatively low cost to any restoration project with a public access component. See Wood, Guerry, Silver and Lacayo (2013) for their meth-odology of using of geospatially referenced photos on Flickr to estimate visitation rates.
	# Number of fish caught per angler trip	• Surveys • Existing data sources	• NA	Existing data may also be available from other sources, such as through the following link from NOAA's National Marine Fisheries Service website.

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Recreation and public access (e.g., birding, fishing, swimming, etc.)	[#] Number of anglers	• Surveys • Existing data sources	• NA	Existing data may be available from state agencies who issue fishing permits.
	[#] Change in number of beach closing days	• Surveys • Existing data sources	• NA	Most likely, salt marsh or oyster reef restoration projects will only have a quantifiable impact on improving water quality and reducing the number of beach closings because of water quality when a sufficiently large number of acres are restored. This metric is not likely to be relevant to small-scale projects.
Water quality	[$] Value of visitors place on the improved water quality (boaters, anglers, beach visitors, etc.)	• Surveys • Existing data sources	• Contingent valuation or choice experiment • Benefit transfer	Note that value placed on the individual experience represents the *social value* of the visitor experience, or the value *beyond* the actual amount spent. This method of valuing public preferences is common when comparing policy alternatives to understand which policies have the largest benefit for the most people. Benefit transfer is a lower-cost option than contingent valuation. However, benefit transfer should only be used if the conditions and demographics of the initial study site are similar to the current restoration site. When possible, benefit function transfer and meta-analysis are more accurate than simple benefit transfer.
	[$] Market value of water quality credits in a water quality market	• Existing data sources	• Market price	Water quality credits for oyster restoration are not currently sold in most Mid-Atlantic states, though they are allowed in certain parts of the Chesapeake.
	[$] Change in property value because of water clarity improvements	• Existing data sources	• Hedonic valuation	Literature shows that proximity to polluted water can lead to lower property values, all else being equal. Water clarity tends to be the preferred water quality parameter, since it is observable by the prospective home buyer.
	[$] Willingness to pay for improved water quality on a water utility bill	• Surveys	• Contingent valuation or choice experiment	By framing the survey in terms of a potential referendum that would result in a fee on a water utility bill, the respondent to the survey is more likely to state an accurate value of what they would be willing to pay, removing the hypothetical bias. Thus, willingness to pay questions should be framed in such a way that the respondent believes that his/her survey answers are likely to impact policy.
	[#] Change in number of visitors because of reduction in number of beach closings	• Surveys • Existing data sources	• NA	Most likely, salt marsh or oyster reef restoration projects will only have a quantifiable impact on improving water quality and reducing the number of beach closings because of water quality when done at the landscape scale. This metric is not likely to be relevant to small-scale projects.