Final Report

Evaluation of Nurture Nature Center's Science on a Sphere and Flood Forums: Education to Action Project

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RMC RESEARCH

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Evaluation Study of Nurture Nature Center's Science on a Sphere and Flood Forums: Education to Action Project

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Founded in 1986, RMC Research Corporation is a national leader in program research and evaluation, consultation, and product development. From small short-term studies to multi-year investigations, we support the work of foundations, federal offices, state agencies, and local organizations in assessing and communicating the impacts of programs and projects. With headquarters in Portsmouth, NH, RMC's eight regional offices collaborate with each other and with partners across the country.

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EXECUTIVE SUMMARY

In 2011, in response to a request from the National Oceanic and Atmospheric Administration (NOAA), the Nurture Nature Center (NNC), in Easton, PA adapted its Community Dialogue Forum model to include a Science on a Sphere® presentation to help forum participants visualize the physical forces underlying global climate change. NNC's model brings scientists together with citizens to learn science by 1) focusing the science learning on local environmental hazards—in this instance, flooding, a common occurrence in Easton and surrounding areas, 2) recruiting broadly diverse citizen participation, including young people, rural residents, low-income residents, and recent immigrants as well as more traditional community science audiences, and 3) involving local and regional decision-makers in crafting forum questions and reporting back to decision-makers about the substance of forum deliberations.

NNC staff created a new Science on a Sphere (SOS) scripted presentation, *Rising Waters*, which illustrates how a changing global climate is projected to bring more extreme flooding to already wet regions, such as the Delaware River Basin where NNC is located. The adapted Community Dialogue Forum included the SOS presentation, a lecture by a scientist, and facilitated small-group and open-floor discussions in which participants used their understanding of the underlying science to answer questions related to mitigating and adapting to local consequences of climate change. NNC also developed materials that other members of the SOS Network could use to replicate the SOS program forums in their own institutions. To further this effort, NNC partnered with the Maryland Science Center (MSC) in Baltimore, MD and the Da Vinci Science Center (DVSC) in Allentown, PA; staff at MSC offered technical assistance in operating the SOS and staff at DVSC and MSC agreed to pilot the SOS program forum.

RMC Research was engaged to conduct a mixed-methods evaluation of three NNC activities:

1) Developing and refining the *Rising Water* script;
2) Conducting SOS program forums; and
3) Refining the SOS program forums for use by other institutions in the SOS Network.

RMC gathered audience data on screen tests of *Rising Waters* from surveys and focus groups and collected data about the forums from observation, surveys, and participant interviews. Data about refining and replicating the SOS program were gathered from interviews with staff of NCC and its two replication partners.

Script Development and Refinement

The *Rising Waters* script went through several iterations of formative evaluation before reaching its final form as a 45-minute presentation delivered by a facilitator who engages audience members in questions and answers over the course of the presentation. This presentation was used, in whole or part, in three climate change forums at NNC and the climate change forum at the Da Vinci Science Center. Maryland Science Center put *Rising Waters* into its rotation of SOS presentations and has offered the facilitated version to home-schooled students. At the request of MSC, NNC also created a 15-minute, fully automated version of *Rising Waters* to accommodate more transient audiences. NNC has also begun work to have the short version of the *Rising Waters* script translated into Spanish for use with Spanish-speaking audiences.

SOS Program Forums

NNC held one forum on climate change for a general audience and two for specific audiences of educators and emergency managers. To test the SOS program forum model with different content, NNC's fourth forum concerned local food access. The Da Vinci Science Center held one forum on climate change for a general audience. Findings about the SOS program forums were drawn from 155 surveys completed at the end of the five forums and 13 interviews conducted with participants several weeks after the forums. Although individual motivations for attending the forums varied, the events largely drew residents of the Lehigh Valley with some interest in climate change or food access.

Several broad themes emerged from analysis of the data.

- **High Value of Discussion.** The strongest theme was that respondents valued the discussion, particularly the small-group discussion, most highly. Ninety-eight percent of respondents indicated they felt comfortable voicing their opinions. Responses to open-ended questions indicated that respondents valued the diversity of perspectives and the opportunity to connect with other people. Most respondents also felt that knowing their responses would be reported to decision-makers deepened the value of the discussion and made them more thoughtful in their responses.
- **SOS Aided Understanding.** The Science on Sphere presentation aided respondents in understanding climate issues from a global perspective. Within the specific audiences, all of the educators rated it as valuable and 97% of the emergency managers agreed that it enhanced their understanding of the role of global climate change in increased rainfall and flood potential. More general audiences noted that seeing other places on Earth where flooding was taking place enhanced their sense of global community.
- **Knowledge Gains and Deepened Understanding.** Almost all respondents reported knowledge gains and deepened understanding of climate change or local food access as a result of their forum participation: 95% agreed that the forum information presented was relevant to them, while 92% said they were better informed about the forum issue. Key points of new learning about climate change were the concepts of phenology (the timing of maturation cycles) and total precipitable water (potential rainfall, increased because warm air holds more moisture). Respondents at the food access forum indicated new knowledge about available farmland and an aging farm population. Emergency managers reported learning about new prediction tools and educators reported learning about using art to teach science as well as some new science terms.
- **Follow-Up Actions.** Respondents at forums for the general public indicated that they were likely to follow up their forum participation with further conversation with friends and colleagues, learning more about the issues raised at the forum, attending similar events, and joining relevant civic and community groups to address climate change or local food access. Educators reported they were likely to share the content of the forum with colleagues and to experiment with teaching science through art activities. Emergency management personnel came away with intentions to increase public awareness and preparedness. Respondents from the food access forum made numerous informational requests about "Buy Fresh Buy Local" activities in the area.

Replicating the SOS Program Forum

Staff at MSC observed two NNC forums and a DVSC staff member was trained and served as a facilitator at one NNC forum. In discussion with NNC staff, the pilot partners identified recruitment and institutional identity as major considerations in replicating the SOS program forum model. NNC has a strong connection to its local community and sees its mission in terms of community programming

rather than, for example, exhibitions, and fostering community dialogue has been the point of much of its outreach. A considerable amount of this outreach has been person-to-person rather than through more traditional media such as print mailings. Institutions with different missions and relationships to their local communities will need to evaluate their capacity and interest in engaging local communities in science-based discussions of local issues. That said, it was clear that with sufficient recruitment and involvement by decision-makers, the forum dialogues benefited from the SOS technology as a way to illustrate global-to-local forces in a compelling way.

Recommendations

The SOS program dialogue forum is a promising model for science centers seeking greater engagement with local communities, particularly on environmental issues. Recommendations for refining an already strong model include:

1. An effective forum addresses an issue of strong community interest and involves intensive and creative outreach to a diverse range of community members and representatives.
2. A number of respondents expressed a wish for hand-outs or other explanatory material.
3. Given the strong respondent interest in discussion, granting more time to this component may allow participants to ask questions directly of scientists, have richer discussions themselves, or have time to synthesize a forum's chief "take-aways" for decision-makers.
4. Completing the "information loop" by informing participants about how their contributions have been conveyed to and used by decision-makers would strengthen the dialogue forum model.

INTRODUCTION

With funding from the National Oceanic and Atmospheric Administration (NOAA), the Nurture Nature Center (NNC) located in Easton, Pennsylvania, acquired a Science on a Sphere® (SOS) projection system in May 2011. Subsequently, NNC staff created a new SOS scripted presentation, *Rising Waters*, on how a changing global climate is projected to bring more extreme flooding to already wet regions, and used this presentation in a series of community dialogue forums on climate and flooding that brought global data to bear on local conditions. This project addressed an interest by NOAA in pairing community dialogue with SOS programming. The Science on a Sphere programming complements community dialogue work NNC has conducted since 2009. With support from the National Science Foundation, NNC hosted a series of community forums that engaged scientists and citizens in thinking about mitigating environmental hazards from flooding in communities in the Delaware River Basin.

The SOS element of the current project was intended to give participants a visual, more concrete understanding of global climate change through the highly engaging Sphere presentations. NNC used *Rising Waters* and other SOS programming to present information in absorbing and visual ways, to enable participants to make global-to-local connections, and to help participants understand and use science to make sound decisions about planning, emergency preparedness, personal safety, and community resiliency.

NNC also sought to test the feasibility of replicating this new SOS program at other institutions in the SOS Network. Partners in piloting the SOS program at their institutions were Maryland Science Center (Baltimore, MD) and the Da Vinci Science Center (Allentown, PA). A final project task was to disseminate materials for replicating the SOS Community Dialogue Model throughout the SOS Network.

The Nurture Nature Center contracted with RMC Research Corporation to conduct an evaluation of the implementation and impacts of three NNC activities:

- Develop and refine a new SOS script on flooding and climate change;
- Use the SOS as part of NNC's Community Dialogue Model that engages community members in learning and using the science related to a local environmental risk, in this case increased flooding and other predicted consequences of global climate change; and
- Refine the SOS program within the Community Dialogue Model for use by other institutions in the SOS Network.

RMC Research used a mixed-methods approach to gather information about the NNC activities, drawing from quantitative survey data and qualitative interview and focus group data. To gather audience data on screen tests of NNC's SOS program *Rising Waters*, RMC staff used both surveys and focus groups. Findings about the benefits of the SOS program dialogue forums were based on observations, surveys and interviews of participants. Finally, findings about the replication of the SOS program were gathered from interviews with staff of NCC and its two pilot partners. A full description of the evaluation methodologies and e protocols appear in Appendices A and C, respectively.

This report begins with brief background descriptions of the Science on a Sphere, the Nurture Nature Center, and NNC's Community Dialogue Model, followed by a discussion of the major evaluation activities—NNC's SOS script development, five public SOS program forums, and pilot-testing the SOS program forum model at Maryland Science Center and the Da Vinci Science Center—and related findings. A summary of cross-cutting themes and implications for future replication precedes a set of recommendations for best practices in using this program model. Appendices contain the Evaluation Methodology, a graphic of NNC SOS program dialogue forum process, and evaluation protocols.

PROJECT BACKGROUND

About Science on a Sphere

The Science on a Sphere® (SOS) spherical projection system was invented in 1995 by Dr. Sandy MacDonald of NOAA as way to illustrate Earth science and complex environmental processes for popular audiences of all ages. Computer-based digital datasets project visual information, such as maps, onto a six-foot diameter Sphere representing Earth (or other celestial bodies). More than 340 data sets and scripts have been created for display on the Spheres and to date, there are 49 Spheres in the U.S. and 30 in other countries. Together they receive more than 24 million views annually. NOAA has supported research into the Sphere's role in science learning, particularly in environmental literacy. A 2010 cross-site study of audience learning as a result of SOS presentations[1] drew two strong conclusions of relevance to the NNC project: a) that the Sphere's greatest perceived value was its ability to give viewers a global perspective and b) that SOS programs facilitated by a docent or other staff add content, stimulate audience discussion, and appear to enhance audience learning.

About the Nurture Nature Center

The Nurture Nature Center (NNC) was established in Easton, PA in 2007 after three major floods occurred in the Delaware River Basin between 2004 and 2006. A science-based community center, it focuses on mitigating local environmental risks by engaging community members through a blend of science, art, and dialogue. More centered on community programming than exhibits, NNC serves as a neutral broker for community engagement in science information and learning. It does not advocate for specific actions beyond increased science learning and citizen involvement.

NNC offers informal science and public hazards education programs to a diverse constituency—citizens, planners, businesses and industry representatives, utility managers, first responders, municipal officials, and regional legislators. In 2008, NNC partnered with NOAA, the National Weather Service (NWS), and the Mid-Atlantic River Forecast Center to develop a flood hazards awareness campaign. Intended to increase the use of flood warning and forecast tools by flood-prone communities basin-wide, the "Floods happen. Lessen the Loss" campaign won numerous awards and produced the website http://focusonfloods.org, an animated film on flood readiness, a four-part radio series, and nationally distributed flood-level warning magnets for households. With National Science Foundation support, from 2009 – 2010, NNC developed its Community Dialogue Model. The current study looks at the introduction of an SOS program and lecture on climate science into this Community Dialogue Model.

About NNC's Community Dialogue Model

NNC's Community Dialogue Model, which the SOS program is intended to augment, focuses on acute environmental risk topics to rivet community attention and enable relevant science learning. It is intended to ground public discussions of those risks in sound science and to enable citizens to deliberate on issues constructively and improve the resiliency of their communities. NNC based its early forum programming on forums conducted by NISE NET museums (Museum of Science in Boston and the North Carolina Museum of Natural Sciences [http://www.nisenet.org/]), but broadened the traditional science museum audience by focusing on environmental hazards and engaging constituencies not

[1] Goldman, K. H., Kessler, C. & E. Danter. (2010). *Science On a Sphere®: Cross-Site summative evaluation*. Edgewater, MD: Institute for Learning Innovation.

generally reached by informal science programs—residents of rural areas, low-income and/or minority citizens, first responders, and teenagers. In 2009 – 2010, with National Science Foundation funding, NNC pilot-tested a Community Dialogue Model that used a science lecture to inform citizen discussions about flooding, a persistent environmental risk in the Delaware River Basin, where NNC is located. An evaluation of the pilot process[2] concluded, based on surveys, interviews, and observations, that participants found the forums engaging, particularly the discussion component, and valued the opportunity to apply new scientific knowledge in realistic scenarios.

Based on these findings, NNC introduced Science on a Sphere programming by using *Rising Waters* as part of its Community Dialogue Model. A description of the SOS program dialogue forum process appears in *From Risk to Resiliency: Better Communities through Science Learning about Local Environmental Risks*, a guide developed by NNC staff. A graphic representation of the process, included in Appendix B, displays it as a sequence of events. Key steps in the process are:

- Conducting discussions with residents and community groups to identify a high-priority environmental risk;
- Consulting with local and regional decision-makers and community members to pilot-test and craft forum topics and actionable (i.e., capable of being acted on) discussion questions;
- Engaging highly credible science advisors who present the underlying science content related to the local risk of concern;
- Intense recruiting in local communities for forum participation;
- Training small-group discussion facilitators;
- Conducting a dialogue forum on an identified topic; and
- Reporting forum discussions and concerns to local and regional decision-makers.

[2] Apley, A., & E. Goldman. (2010). Engaging citizens in science dialogue: An evaluation of the Nurture Nature Foundation's Flood Forum project. Portsmouth, NH: RMC Research Corporation

MAJOR EVALUATION ACTIVITIES AND FINDINGS

RMC's evaluation activities comprise a formative evaluation of the new SOS program script developed by NNC, a summative evaluation of five SOS program community dialogue forums, and a synthesis of interviews with staff from NNC and the pilot partners to inform the replication of the program.

Rising Waters Script Development and Refinement

A key component of the project was the development of a new program script, provisionally titled *Global to Local Flooding and Changing Climate*, for use with the SOS technology. Following a review of the draft script for scientific integrity by scientists at NOAA as well as the project science team (including representatives from the Dartmouth Flood Observatory, National Weather Service, Lehigh University, and Northeast Regional Climate Center), RMC staff conducted four focus groups with audiences at the Maryland Science Center and NNC in July 2011. These locations were selected to reflect the contrasting venues and audiences for which the SOS presentation was being developed—that is, a large institution in an urban setting, with considerable tourist visitation, and a smaller, more locally oriented center.

The focus groups addressed the science content, the visual presentation of datasets, and explanatory commentary. Fifty-five participants (26 in Baltimore, 27 in Easton) watched the pilot, responded to a brief written survey and took part in a semi-structured discussion. Participants in both settings found the content interesting, although participants from Easton, which has a history of devastating floods, appeared to understand the emphasis on flooding more clearly than those in Baltimore. Both groups were impressed with the global perspective the Sphere provided.

Other responses suggested that the focus of the script was unclear, its message diffuse, its elements—weather, climate, travel, global warming, and local effects—disconnected, and its storyline weak. Participants did report gains in understanding flooding as a global phenomenon and the link between human activity and global climate change but overwhelmingly wished for a more positive, solutions-based message.

The script was substantially revised following these tests with pilot audiences and a professional screenwriter was engaged to strengthen the narrative. The revised script, *Precipitation Trends, Flooding, and Community Resiliency Program*, underwent further focus group analysis. A second RMC evaluation drew on responses from 43 participants who completed surveys as part of a two-week long series of public screenings in Easton of the program, followed by discussions facilitated by NNC staff members. Findings suggested that the presentation had sharpened its focus and offered a coherent narrative. Asked to characterize the SOS presentation from a list of adjectives, 94% or more of participants choose "interesting," and "informative". Participants generally gave the program high marks for delivering the key science content clearly, particularly content about flooding as a result of climate change (84% very satisfied), the weather – climate relationship (79% very satisfied), and precipitation trends (69%). All respondents (40) said they would recommend the program to others.

After further revision the program was renamed *Rising Waters*. This script, which includes both docent-led and audio-recorded elements, was finalized and approved by NOAA. NNC shows *Rising Waters* regularly once a week to the public, and makes it available by request.

At the request of the Maryland and Da Vinci Science Centers, NNC created a shorter, fully automated version of *Rising Waters* to accommodate more transient audiences. The short version reduces the 45-minute presentation to fewer than 15 minutes and does not require a facilitator. In other efforts to make *Rising Waters* available to wider audiences, NNC has also begun work to have the short version of the *Rising Waters* script translated into Spanish for use with Spanish-speaking audiences at NNC and elsewhere and has collaborated with Lehigh University at the Dartmouth Flood Observatory to produce three new SOS datasets on geographic areas with 50 or more fatalities from flooding, areas with 250 or more persons displaced due to flooding, and areas of flooding due to heavy rain (rather than ice jams or snow melt, etc.).

NNC's incorporation of *Rising Waters* into its Community Dialogue Model is described below.

SOS Program Community Dialogue Forums

As noted, NNC's Community Dialogue Forum model draws on local environmental concerns. The SOS program forums used *Rising Waters* to illustrate the physics of rising Earth temperatures and climate change, and to connect those phenomena to local events such as the then-recent Hurricane Irene. NNC developed three of its four SOS program forum topics on climate change in response to discussion and requests from audience members during weekly showings of *Rising Waters*. General audiences had posed numerous questions about climate change, prompting the focus of the first forum; municipal officers and educators who attended *Rising Waters* shows requested forums tailored to their specific audiences.

Staff at both the Maryland Science Center and Da Vinci Science Center agreed to incorporate *Rising Waters* into their SOS programming; MSC staff also offered guidance and support in using the SOS program, observed two NNC dialogue forums using the SOS program, and offered to pilot an SOS program dialogue forum at MSC. Staff at the Da Vinci Science Center served as a facilitator at one NNC event and agreed to pilot the SOS program dialogue forum at an in-house event.

This report draws on survey findings from five *Rising Waters* SOS program dialogue forums—four held at NNC and one at Da Vinci Science Center, as well as qualitative interviews with a number of forum participants.[3] Information about the feasibility of replicating this program model is drawn from interviews with NNC and partner organization staff and RMC staff observations of events.

Climate change and flooding was the topic for three of the four NNC SOS program dialogue forums and the Da Vinci Science Center forum. In order to test the dialogue model on other topics, the final NNC forum concerned diminishing farmland globally and questions of food access locally; it featured a new SOS presentation, *Two Billion More Coming to Dinner*. All of the forums took place at the host institution and all varied either by duration, audiences addressed, the institution's relationship to the community, and the extent of the *Rising Waters* SOS presentation. At least two forums were also affected by severe weather. The brief descriptions of each below give an indication of the audience

[3] In all, six SOS events were planned during the course of the project: four at NNC, one at Da Vinci Science Center, and one at the Maryland Science Center. Maryland Science Center volunteered to pilot a forum even though it was outside of their scope of work for the project. That forum was cancelled for lack of audience; RMC staff, however, were able to observe a facilitated *Rising Waters* program delivered to an audience of middle-level home-schooled children and their caregivers.

attending, the forum focus, external conditions, and the nature of the event. Overall findings and cross-cutting themes are discussed following the descriptions.

Event I. NNC, February 9, 2012. General Public Forum

The Future of the Lehigh Valley: What Will Climate Change Mean for Us?
This first SOS program dialogue forum, aimed at a general audience, featured the third of a series of public lectures on climate change by Dr. Dork Sahagian, a member of the Nobel prize-winning Intergovernmental Panel on Climate Change (IPCC) and Professor of Earth and Environmental Sciences at Lehigh University.

Dr. Sahagian reminded the forum audience of Pennsylvania's historic role in fossil fuel extraction before addressing the science behind global temperature rises. In essence, warm air holds more water, he said, leading to increases in "total preciptable water" or potential rainfall. Increased rainfall and flooding are consequently predicted to occur in areas already prone to flooding, such as the Lehigh Valley. Dr. Sahagain used portions of *Rising Waters* to show places on Earth where flooding was currently taking place and to highlight their overlap with areas of population density. Following Dr. Sahagian's talk, facilitated small-group discussions took place in an adjacent space. In groups of four to six people, participants answered and discussed two multiple-choice questions: *Is it the responsibility of the local community to address climate change? If we can expect wetter conditions in the future and therefore more flooding, how do you think local communities should prepare?*

The questions were developed by NNC staff in consultation with local decision-makers (in this case the Lehigh Valley Planning Commission, which is beginning year one of a three-year Lehigh Valley Climate Change Plan). Facilitators, trained to ensure that participants engaged in civil dialogue, led the small-group discussions and took notes on the general substance of discussion at their tables. Participants were asked to think in silence about each question, and then engage in 10-minute discussion with others before recording their answers. Following the small-group discussions, NNC staff projected pie charts of audience responses to each question on a screen and a brief open floor discussion took place. Approximately 90 people attended the lecture and about 80 stayed for the small-group discussion.

A report from this forum was delivered to local decision-makers and made available on the NNC website, http://nurturenaturecenter.org/wp-content/uploads/2012/02/Climate_Forum_Decision_Makers_Report_Final1.pdf

Event II. NNC, March 15, 2012. Emergency Responders Forum

"Extreme Weather"—Moving from Risk to Readiness (Lessons Learned from Irene, Lee and More)
The second forum, held for a specific audience of emergency responders, attracted 31 professionals from the Lehigh Valley. The SOS presentation *Rising Waters* was shown in its entirety, with facilitation by an NNC staff member. After the presentation, participants discussed local planning and technology needs, focused on a single question: *As your community prepares for future flooding events, what changes in emergency planning and/or technology do you think would be important to have?* Participants were asked to think quietly about the question and then hold a conversation at their table for about ten

minutes before answering; facilitators were not used because the audience members were comfortable with each other.

The discussion was followed by presentations from the Northampton County Emergency Services Director on information for local emergency managers and the National Weather Service on the latest technology available in flood warning and awareness systems, including forecasting tools, inundation mapping, and communication aids for emergency managers and first responders.

A report from this forum was delivered to local decision-makers (in this case the directors of emergency management in the two-county Lehigh Valley) and made available on the NNC website, http://nurturenaturecenter.org/wp-content/uploads/2012/02/Emergency_Managers_Forum_Decision_Makers_Report_Final.pdf

Event III. NNC, April 16, 2012. Educators Forum

Rising Waters: Weather and Climate – A Global to Local View

The third forum was a day-long event for high school teachers and attracted nine Lehigh Valley educators from six schools. The program included *Rising Waters* in its entirety, a facilitated discussion, a demonstration on using art to generate student interest in climate and other science topics, a hands-on workshop led by the Delaware Canal State Park staff on land use and watersheds, and a series of lectures by Nick Henshue, a local high school science teacher with nationally recognized expertise in teaching climate change. The lectures addressed basic climate science and ways to explain "what we know we know" on climate change to enhance students' comprehension of the issue. Mr. Henshue facilitated a group discussion about the assets, barriers, and difficulties of teaching climate change. Teachers were divided into two groups and asked to discuss and list a) favorable influences, b) unfavorable influences, c) resources, and d) drawbacks encountered when teaching climate change in the classroom. Following the discussion, each group presented its results, which suggested that although resources and support for teaching climate change are available, teachers face difficulties from public perceptions and media portrayals of climate change science.

Intended to introduce educators to NNC resources, and incorporating strategies that integrate science, art, and dialogue to inspire critical science thinking, the forum provided educators with curriculum-based material that met the Pennsylvania Academic Standards for Science and Technology and Environment & Ecology for grades 4 through 12. Six professional development hours were granted to the Pennsylvania-certified teachers upon completion of the program.

A report from this forum was disseminated to all the attending participants, who were encouraged to share it with their school administrators, and made available on the NNC website, http://nurturenaturecenter.org

Event IV. NNC, July 26, 2012. General Public Forum

Lehigh Valley Forum: Local Food Economy

Designed to test the SOS program community dialogue program with another topic, the July 26 Lehigh Valley Forum focused on the "Local Food Economy." The event attracted 78 participants (90 people had

registered, but a serious storm warning kept a number away). Following an art reception, "Food for Thought," featuring the work of artists in the Lehigh Valley on the theme of fresh food, NNC staff intended to premiere *Two Billion More Coming to Dinner*, a new Science on a Sphere presentation about rising population, food access, and the future of agriculture. However, the storm caused mechanical difficulties and the presentation could not be shown in its entirety. Lynn Prior, director of Buy Fresh, Buy Local, a program of the Nurture Nature Center, gave a talk about the Lehigh Valley Fresh Food Access Plan[4] and discussed issues related to food access, such as the national transportation grid, and local resources for fresh food. Following the dialogue forum pattern described above, the small-group discussion focused on two questions: 1) *What is your primary concern about the Lehigh Valley food economy now?* and 2) *Given that at present we can only feed 24% of our population and we're expecting about 145,000 more people in the next 20 years, what should be the top priority for our local food economies?*

After the forum, NNC staff wrote a blog that was posted on the website of the group leading the development of the Lehigh Valley Sustainability Plan, sent the blog to the Buy Fresh, Buy Local mailing list, and posted it on NNC's website and that of a local online news source.

Event V. Da Vinci Science Center, September 19, 2012. General Public Forum

Brainstorm Forum: Global Climate Change

Nine people, including two school-age children, attended the Da Vinci Science Center's "Brainstorming Forum" on global climate change; more people registered for the event but serious weather conditions, including a tornado warning, may have kept a number away. The forum began with an open reception featuring the guest presenter Dr. Dork Sahagian. During the reception *Rising Waters* was running on the Center's Traveling Planet, a 24" diameter sphere linked to a computer.[5] After the reception, Dr. Sahagian gave a 30-minute presentation on global climate change and its implications for the Lehigh Valley. Following the presentation, five people remained to participate in a small-group discussion that included answering and discussing two questions: *1) Is it the responsibility of the local community to address climate change, and 2) If we can expect wetter conditions in the future and therefore more flooding, how do you think local communities should prepare?* Dr. Sahagian sat with the group, which conducted a spirited discussion on the issues for about an hour.

Participant Responses to SOS Program Dialogue Forums

RMC's findings are drawn from participant responses to surveys and interview questions about the forums they attended and an observation of an SOS program dialogue forum. After each forum, participants were asked to complete an evaluation survey that asked what they valued about the forum, what they learned, and what they intended to do with the new information. This section summarizes the qualitative and quantitative results gathered from 155 respondents across the five forums and interview data from 13 interviewees gathered several weeks after each forum. The primary purpose of the interviews was to learn about follow-up actions taken after the forum and understand the forum's value in more detail. Survey and interview findings were analyzed for common themes and patterns across the five forums. Three of the five events were open to community members; two events addressed specific

[4] The Access Plan is part of a larger Lehigh Valley Sustainability Plan.
[5] The intention was to show the *Rising Waters* on the Center's in-house five-foot globe; however, it malfunctioned.

professional audiences—emergency managers and educators. Although individual motivations for attending the forums varied, the events largely drew residents of the Lehigh Valley with some interest in climate change or food access.

From the quantitative and qualitative findings, several key themes emerged and are discussed in more detail below:

- Respondents valued the discussion, particularly the small-group discussion, most highly.
- The use of the SOS aided respondents in understanding climate issues from a global perspective.
- Almost all respondents reported knowledge gains; they were better informed, in the sense of gaining new information and deepening their understanding, as a result of participating in the forum.
- Intended follow-up actions included talking further about the issue with friends and colleagues, learning more, attending other events, and joining related civic or community groups.

The High Value of Discussion

A key element of the forum model is creating opportunities for people to share ideas and beliefs in an informal, non-ideological setting. Findings showed that 98% of all respondents felt comfortable voicing their opinions during the discussions. It is also notable, because the forums contained detailed science content, that 95% of all respondents agreed that the information conveyed in the forum was relevant to them. Ninety-six percent agreed that the forum they attended matched their expectations. Table 1 shows these results.

Table 1. Percent of Respondents Who Agreed or Highly Agreed on Value of the Forum

	% Agreed or Strongly Agreed (n=155)
Comfortable in voicing opinions	98%
Forum matched expectations	96%
Information presented is important	95%
Better informed about climate/food issues in community	92%[6]

The three main components of the SOS program dialogue forum are a lecture accompanying an SOS presentation, facilitated small-group discussion, and an open floor discussion. Asked to rank elements of the SOS program forum they attended, most respondents reported that they valued the small-group discussions more highly than the open floor discussion or the lecture/presentation.

Among specific audiences, educator interviewees valued learning first-hand from Nick Henshue, another educator. Emergency managers interviewed said they valued sharing information with their county-level counterparts and municipal peers. They praised NNC for helping communities learn to "lean forward" and prepare for emergencies.

[6] Responses do not include emergency managers.

Open-ended responses by general audiences to the questions about the forum's highest value elaborated on the value of discussion, particularly on the diversity of perspectives, the opportunity to connect with others, and the structure of the facilitated discussions. A word cloud graphic of the frequency of responses, excluding the words "discussion" and "food," is shown below. Words used more frequently in the open-ended survey responses appear larger in the word cloud, illustrating important themes and patterns. The graphic highlights "people," "ideas," "climate," "change" and other terms that reflect the intent of the SOS program dialogue forum.

Illustration 1. Highest Frequency Mentions of What Participants Valued Most Highly about Forums.

Diversity and Community. The diversity of opinions and open discussion were other positive features of the forums. Sample statements include:

- *That we were able to discuss our opinions and concerns … without having to come to a consensus.*
- *The studies and opinions and views of people at my table. Good points and conversation.*
- *Talking with others on these issues and hearing a totally different perspective even though I think about this every day.*
- *Diverse thoughts from peers in the community being shared to create positive outcomes.*
- *Learning about other people's opinions on the topic. Lecture was interesting, but individuals make change so their opinions are important.*
- *It is easier to voice opinions in small group discussions as opposed to large "town hall" discussions.*

Others valued the event itself and the opportunity to meet new people with a shared interest. One interviewee described the forum, with a focused discussion on local issues, as "brilliant." Another said, "This type of conversation needs to happen more often." Survey respondents remarked that:

- *Giving community members a chance to talk about what they think is extremely valuable.*
- *Community initiative to come out, talk, and learn more.*
- *Meeting people from the community with similar interests.*

Informing Decision-Makers. Part of the SOS program dialogue forum entails creating relevant, actionable discussion questions for a forum. NNC staff conferred with local decision-makers about questions for the facilitated small-group discussion with the understanding that decision-makers would receive a follow-up report on participants' responses to the questions. For most respondents, knowing that their choices and comments would be passed on to decision-makers deepened the value of the dialogue, for example,

- *[I valued] discussion and feeling that comments are actually being heard.*
- *How awesome to attend a forum and know that we are being heard and that we have made a contribution of some kind.*
- *I took answering the questions more seriously knowing that my answers may contribute to a solution.*
- *You can't complain about an issue unless you actively participate in trying to have an impact.*

Science on a Sphere as an Aid to Understanding

Each SOS program dialogue forum employed the *Rising Waters* presentation differently. For example, the first NNC forum for the general public used the Sphere in a limited way, to illustrate several lecture points, while SOS use during the fourth forum (on Lehigh Valley food resources, with a new SOS presentation on food) was hampered by technical difficulties exacerbated by poor weather. The two NNC forums for special audiences (emergency managers, educators) showed *Rising Waters* in its entirety. The *Rising Waters* presentation was shown at the Da Vinci Science Center reception, but was placed to the side and participants could view it at their own pace.

Because they did not see the full *Rising Waters* SOS presentation, respondents at the three general audience events made limited comments about the Sphere. However, those who did mention the Sphere used terms such as "awesome" to describe it, and a small number identified the Sphere as the most valuable element of the forum.

The two forums for targeted audiences, emergency managers and educators, included the full *Rising Waters* presentation on the SOS. Among emergency managers, 97% of respondents agreed or strongly agreed that the presentation enhanced their understanding of the conditions for precipitation and the potential for increased flooding as a consequence of global climate change. Among educators, all respondents rated the Sphere as valuable; two-thirds (six of nine people) rated the Sphere presentation as "very valuable."

The Sphere appeared to play a useful role in communicating science content, whether *Rising Waters* was used in a limited way or shown in full. This suggests that the SOS technology is an effective way to represent global systems as meaningful context for locally observed phenomena. As an emergency manger said in an interview, "it gave a real perspective and picture." The Sphere display appears to help audiences understand large-scale forces that are "invisible" in the sense that they occur at a massive scale; in this instance it enables viewers to see equatorial concentrations of higher temperature and rainfall and their interaction with other forces such as ocean currents and jet streams. Global views of current flooding also appeared to reinforce respondents' sense that "we are all in this together." Interviewees had strong praise for the Sphere. A teacher explained, "you could not look at it and the patterns and currents without … extrapolating future conditions."

Participant Knowledge Gains

Respondents described their knowledge gains in terms of both new learning and of deepening their understanding of global climate systems and related issues.

New Learning. The SOS program dialogue forum is intended as a vehicle for learning. Ninety-two percent of all respondents reported that they left the SOS program forums better informed about the topics under discussion. Specific points of learning mentioned by general audience respondents included *phenology*, the study of periodic biological phenomena (migration and plant flowering patterns have been disrupted by global climate change) and *total precipitable water*, the potential rainfall in the atmosphere at any moment (warmer air holds more water, hence increases total precipitable water).[7]

Respondents at the general public forums reported specific information gains:

- *I was surprised to hear Pennsylvania has the third highest emissions in the US and the 20th worldwide.*
- *I didn't understand floodplains as well as I do now.*
- *[I learned] details of the A-2 and BAU (Business-as-Usual) emissions scenarios for northeastern USA.*

An interviewee saw the climate change focus as especially meaningful in the context of Pennsylvania's historic involvement with the fossil fuel industry.

Respondents at the forum on local food access indicated learning more about decreasing farmland and the increasing age of current farmers, and gained a sense of urgency, for example:

- *I realized how old farmers are in the [Lehigh Valley]! I also realized how big an issue this is in regard to farmland preservation and land availability.*
- *The numbers presented of dwindling farmland, the fact the Lehigh Township cut the budget for farmland preservation is shocking.*

When responses from emergency managers and educators are analyzed separately, all indicated that they were better informed as a result of the SOS program forum. Respondents among emergency managers valued specific information about weather and notification capabilities, particularly services provided by the National Weather Service. Many of the educators had science backgrounds and concepts such as climate as the synthesis of all recorded weather events were familiar; the specific concept of "total precipitable water" was unfamiliar to some. One part of the educators' event was a lesson on using art to engage students in science learning. Indications of learning by these two groups may be influenced by the domain-specific information.

Deepened Understanding. At the forums where climate change was the focus (Forums 1 – 3, and 5), respondents also described gaining better understanding either of a whole system, such as Earth, or of local impacts of global forces. Sample comments include:

- *I learned to look at Lehigh Valley with a different scope.*
- *[I have] a clearer picture of local changes from climate change.*

[7] A severe Halloween storm the previous fall dropped snow on trees still heavy with leaves, an instance of phenological disruption that caused more than usual tree and property damage.

- *I know new terminology and have a more realistic understanding of the issue.*
- *I have a deeper, more comprehensive understanding.*

Respondents at these forums were asked to predict how climate change would affect them locally and to evaluate their communities' preparedness for climate change effects. Most identified increased flooding and changes in weather, such as:

- *More flooding, health issues (more allergies, asthma, etc.) negative agriculture impacts.*
- *More flooding—really bad in Easton. I don't really want to return to this region once school is over.*

Perceptions of community readiness were largely negative; respondents cited apathy and lack of education as chief explanations. A small number predicted social changes, both positive (community resilience and solidarity) and negative (economic disruption and community stresses). Some respondents also mentioned learning about the importance of community science education and public forums such as the one they attended.

Intentions to Follow Up

Information is generally considered knowledge when someone in possession of the information can use it. By this measure the SOS program dialogue forums were successful in sparking participants' intentions to apply their new knowledge in some way. These intentions suggest continued engagement with the content and issues presented at the forum.

Asked to choose possible actions they were likely, very likely, or not likely, to take following the SOS program forum, the greatest number of respondents (97%) indicated that they were likely or very likely to take part in conversations with friends, family, neighbors, and colleagues about issues raised at the forum. Nearly as many (91%) reported that they were likely to seek more information about the topic that was the focus of the forum. A slightly smaller number (87%) indicated that they were likely to attend other public forums on the topic if they were offered. More than three quarters (78%) reported they were likely to get involved in community meetings on local issues or become involved with meetings such as comprehensive planning, municipal government, or community planning. This pattern, with likelihood of further conversations on the topic most common, followed by information-seeking and attending public meetings or events on the topic, held true across all three of the general audience forums. The table below presents these figures.

Table 2. Percent of Respondents who Agreed or Strongly Agreed with Intended Actions After the Forum

	% Agreed or Strongly Agreed (n=125)[8]
Contribute to conversations and share ideas with others	97%
Learn more about climate change	91%
Attend additional forums on similar topics	87%
Get involved in community planning on related issues	78%[9]

[8] Responses do not include emergency managers.
[9] Responses do not include emergency managers or educators.

Among general audiences, one interviewee expressed a wish for a conclusion or "restatement" at the end of the forum to give a sense of what message was going to decision-makers; another wished for some kind of follow-up event. (NNC makes space available to community groups but does not itself convene community groups.) One interviewee reported he now exchanges climate change information online with a fellow forum participant. Another plans to write letters to the editor, and another, a self-described activist, is looking at non-traditional ways of engaging people in climate change issues.

Respondents at the audience-specific forums identified follow-up actions consistent with their professions. Educators described their intentions largely in terms of classroom applications, although one indicated plans to develop presentations to "educate park and public school audiences about climate change." All of the educators indicated they were likely to learn more about weather and climate change; most said they would share the forum's content with colleagues and use the workshop resources in their classrooms. Educators interviewed were enthusiastic about the "strong possibilities" of using art to introduce science topics; a map activity on land-use patterns was mentioned as a compelling visual and kinesthetic experience.

Emergency managers clearly came away with applicable knowledge of new notification products; among actions they said would be important were greater public education, increased resource sharing and training, and renewed efforts to engage the public as volunteers during emergencies. Emergency managers interviewed offered to assist NNC in future presentations, if requested.

Interviewees who attended the forum on local food resources said they had talked about food access issues with others. One planned to work on preserving farmland; another is considering a personal garden. On a broader scale, anecdotal evidence from NNC staff pointed to overwhelming numbers of requests for information by local residents about the Buy Fresh Buy Local program following the event on local food access.

Piloting the SOS Program Dialogue Forum

RMC staff conducted interviews and focus group discussions with all four members of the NNC staff, four members of the Maryland Science Center staff, and the Education Manager of the Da Vinci Science Center. The focus and content of these discussions are presented in chronological order to reflect the partners' evolving understanding and experience of implementing the SOS program using the Community Dialogue Model.

Planning

The community forum model was new to both the Maryland Science Center and Da Vinci Science Center at the project's outset. While both institutions offer educational programs, these programs do not usually include a discussion component, nor are they intended to provide feedback to decision-makers. The SOS program using NNC's Community Dialogue Model also necessitated a change in how the partner institutions used the SOS technology. Typically SOS programs are automated at both centers; sometimes they are facilitated by a docent at MSC, but usually run in a continuous loop and visitors come and go at their own pace. Staff at both institutions looked forward to learning more about the Community Dialogue Model, and both planned to offer some version of a public forum based on *Rising Waters* during the course of the project. Staff of both partner institutions recognized the challenge of recruiting participants.

The topic of flooding was of recent concern to staff at both the Maryland and Da Vinci Science Centers. Jim O'Leary, Senior Director of the Maryland Science Center, noted that his institution has done some minor programming on flooding in the past. Allentown, Pennsylvania, site of the Da Vinci Science Center, was developed with park land on either side of the Lehigh River, and flooding has not traditionally been a major concern. Hurricane Irene, however, caused noteworthy flooding, and Karen Knecht, the Center's Education Manager, felt that audience interest in *Rising Waters* and a forum on climate change would be strong. At the beginning of the project Knecht and O'Leary attended a kick-off meeting with Professor Dork Sahagian of Lehigh University, for which both expressed deep appreciation.

Participation

Three representatives of the Maryland Science Center (MSC) and Karen Knecht of the Da Vinci Center attended NNC's first SOS program dialogue forum in February 2012. The MSC representatives observed the event and Knecht, who had received prior training, served as a table facilitator during the small-group discussion. Jim O'Leary of MSC also attended the SOS program forum with emergency managers. All found the observation of a forum useful, remarking that it clarified the process to see it first-hand. Knecht noted that she felt more confident about running a forum at her institution after taking part in the NNC event. Felicia Savage, Education Director of the Maryland Science Center, and Knecht both expressed concern about finding "the audience that this is relevant to." Savage suggested MSC might reach out to homeowners in flood-prone areas. Knecht said that the Da Vinci Science Center might lack staff for door-to-door recruiting and would need to rely on other formats.

All four expressed interest in more information about the forum discussion questions—including the evolution of the final questions, and reasons for choosing them—that NNC staff developed in consultation with decision-makers. They also proposed alterations of the SOS program forum model. Knecht suggested she might try a somewhat longer discussion period, and Savage proposed to prepare some visual, hands-on explanation of water and thermal expansion.

The Da Vinci event attracted a smaller than expected number of participants. Knecht explained that turnout at free events with light refreshments typically attracted audiences and the topic of climate change was one she knew patrons were interested in. She wondered if the discussion component intimidated people; it was not a typical Da Vinci Science Center offering. Tornado warnings the afternoon of the event also likely kept people away. In the future, she said, she would use more personal marketing.

Maryland Science Center did not hold a forum, although staff planned one for May 2012. MSC staff arranged with a University of Maryland scientist to speak on climate change and local flooding and mailed 500 post cards to residents in zip codes where flooding occurs. Although they planned for an audience of 50, only five people responded to the invitation, and MSC staff cancelled the event. In June 2012 MSC added *Rising Waters* to its rotation of SOS programming; MSC staff also included it as a special program for home-schooled students. Both DVSC and MSC staff requested a shorter version of *Rising Waters* that could be used without a facilitator.

Considerations in Piloting the SOS Program/ Community Dialogue Model

A final debriefing with Jim O'Leary, Karen Knecht, NNC staff members, and the RMC team was held in Easton following the final forum at the Da Vinci Science Center. O'Leary and Knecht described their experiences with running SOS program forums.

O'Leary concurred with Knecht that the discussion element may have inhibited audience interest. "It's different from what we do," he said, noting that personal outreach would be included in any future events along with more notices about the event such as a listing on MSC's website. Both Knecht and O'Leary described themselves as "feeling their way into a new model," in piloting the SOS program forums and proposed testing the SOS program dialogue forum with board members or sponsors. Knecht said that the Da Vinci Science Center was conducting a needs assessment as part of the Center's new strategic planning as it works to reflect its region and local population more. The Da Vinci Science Center currently has a strong professional development program for educators and may look to the SOS program forum model as it expands its adult education programming.

In response to questions about recruiting, Brandes described the extensive "legwork" staff did during the NSF-funded community dialogue project, speaking with residents, firefighters, community leaders, and township authorities, as well as attending community events. The area had seen several strong floods in rapid succession and people brought a passion to the discussion, she noted.

NNC operates much more through word of mouth and physical presence than many science centers do, and preparing for a forum could necessitate a cultural shift for a different kind of organization. NNC staff regard outreach efforts as a form of needs assessment as well as forum recruitment. A key piece of learning for NNC, staff said, was to ground its programming in issues of high community concern.

The SOS program forum model includes interaction with local decision-makers, both in developing discussion questions and in reporting forum decisions and discussion content back to decision-makers. Indeed, respondents valued knowing that their comments and ideas would reach decision-makers and many noted that they took their responses more seriously, knowing that they had an audience. Institutions seeking to replicate NNC's SOS forum model will need to identify and determine how and with whom questions will developed and reports shared.

SUMMARY

SOS Program Dialogue Forum Impacts

Two strong messages emerge from the findings. The first concerns the high value to participants of structured **discussion** during the forum. The second concerns the value of the **information** conveyed—its relevance to participants, their sense of leaving the forum better informed, and the strong likelihood that they would seek to learn more about the science content and issues at the center of the forum. Respondents rated both the discussion and information gains more highly than any other aspect of the SOS program forum.

Findings related to the discussion confirm the efficacy of integrating SOS programming into the NNC's Community Dialogue Model to include not only content-rich lectures but opportunities to examine local issues from a global perspective and engage in dialogue with other community members. In comments, respondents valued the diversity of opinions expressed and opportunities to test their ideas against those of other people; they also appreciated discovering other people who shared their perspectives. Generally accepted theories of the social construction of knowledge suggest that participants make meaning of events through conversation and dialogue, articulating their own understandings and attending to and considering alternate views.

Findings suggest that NNC's SOS program dialogue forum also appeared an effective stimulus to continued information seeking. In addition to discussion, respondents also indicated they were "likely" or "very likely" to "learn more about the topic." For participants vaguely familiar with climate change issues, an explanation of the underlying science, shown both in *Rising Waters* and in presentation materials created by Dr. Sahagian and others, helped them make sense of possible future impacts. The role of atmospheric heat in local weather events and the greater potential rainfall now available to global systems became clear and logical. For participants already familiar with much of the ongoing climate change dialogue, the forums added a welcome level of "granular detail." The SOS program dialogue forum also appeared adaptable to other content in the forum dedicated to food access issues.

The networking and learning aspects of the SOS program dialogue forum appear strong. The SOS presentation was a clear and positive addition to the Community Dialogue Model, making global systems such as air and water currents and Earth's uneven heating patterns visible. As a physical model, capable of showing global changes in real time, it enabled participants to comprehend Earth as a single physical system with multitudinous local effects. The descriptions and models of projected local impacts from global systems created a clear sense of urgency among many participants.

Replicating the SOS Program Dialogue Forum Model

Discussions with partner organizations highlighted challenges—primarily recruitment—and successes—chiefly rich discussions and gains in science knowledge—in the SOS program forum model. Based on conversations with staff at the Nurture Nature, Da Vinci, and the Maryland Science Centers, it is clear that the SOS program dialogue forum may not be appropriate for every institution in the SOS Network. The model may work best when a science center's mission and culture align closely, as NNC's does, to the needs, concerns, and interests of its local population. An institution might need to secure additional resources to conduct personal marketing and community engagement. That said, there is a trend toward greater community involvement among museums across the spectrum, as the authors of the current

report found in an extensive study for the Institute of Museum and Library Services[10]. The SOS program dialogue forum may offer an authentic way for science centers to engage community members in meaningful discussion of local issues informed by a global perspective.

A guide for SOS Network members developed by NNC outlines each step in the SOS program dialogue forum model. In brief, key best practices emerging from the NNC study are as follows:

A. **Mission alignment.** Institutional size and culture are important in determining a good fit for the SOS program dialogue forum. In addition to the necessity of establishing local relevance, the full process involves a range of players and a carefully thought-out and implemented structure. The model is a promising entrée into community engagement for science centers, given available resources and labor.
B. **Decision-maker involvement.** The SOS program dialogue forum is intended as a phase in a larger dialogue that engages decision-makers in issues of community concern and later reports community thinking back to decision-makers. Knowing their responses could contribute to policy choices was a strong motivation for respondents to take the discussions seriously. To be effective, it is important that questions devised by science center staff and shaped by decision-makers and community members are thought-provoking and capable of being acted on through policy or practice.
C. **Recruitment methods.** In general, the NNC Community Dialogue Model requires a strong recruitment process to garner interest. For NNC staff, extensive personal, door-to-door, neighborhood-based outreach was essential. Institutions seeking to adopt the SOS program dialogue forum will have to determine recruitment processes that work best for their audiences. More typical approaches, such as print materials, may not suffice.
D. **Presenter credibility.** It is important that presenters have scientific credibility, both to underscore the presenting science center's trustworthiness and objectivity and to answer audience questions, some of which may be of a technical nature. Some training of scientists on communicating with public and non-scientific audiences may be advised. The Nurture Nature Center has worked with scientist presenters to help bridge the gap between scientific and non-scientific understandings of science concepts and terms such as "theory" and "uncertainty."

[10] Apley, A., Frankel S., Goldman, E., & K. Streitberger. (2011). *Supporting museums – serving communities: An evaluation of the Museums for America program*. Portsmouth, NH: RMC Research Corporation.

RECOMMENDATIONS

The SOS program dialogue forum holds promise for science centers seeking greater engagement in environmental issues or with local communities, or both. Recommendations are offered in the spirit of refining an already strong model.

1. Effective forum topics address issues of strong community interest, based on discussion with a range of community representatives. Assessing community needs and interests becomes, in effect, an aspect of forum recruitment. It is through personal contact and conversation that forum planners determine viable topics and begin to generate recruitment networks. Traditional outreach methods and media may be inadequate.
2. A number of respondents expressed a wish for hand-outs or other explanatory material. Making materials available at forums that participants could share with others or remind themselves of key points could help reinforce a forum's message or science content.
3. The SOS program dialogue forum model is rather ambitious, folding several experiences—lecture, visual display, structured discussion—into a relatively brief time (typically two hours). Providing additional time for discussion may allow participants to ask questions directly of scientists, have richer discussions themselves, or have time to synthesize a forum's chief "take-aways" for decision-makers.
4. Another element of the process of the SOS program dialogue forum model that could be strengthened is to encourage science centers to follow up with decision-makers to learn how the information gathered from forum participants is being interpreted and used by decision-makers. Completing the information loop will strengthen the SOS program dialogue forum model and honor participant contributions.

APPENDICES

APPENDIX A: Evaluation Methodology

RMC Evaluation Methodology

RMC Research Corporation, a national evaluation and research firm based in Portsmouth, NH, was contracted to conduct an evaluation of Nurture Nature Center's project, **Science Sphere and Flood Forums: Education to Action**, funded by the National Oceanic and Atmospheric Administration (NOAA). Evaluation activities were designed to address three NNC goals:

1) To develop, test, and refine a facilitated Science On a Sphere (SOS) script on flooding and climate change;
2) To use the SOS as part of Nurture Nature Center's Community Dialogue Model that engages community members in learning and using the science related to a local environmental risk, in this case increased frequency and severity of flooding and global climate change; and
3) To refine the SOS program within the Community Dialogue Model for use by other institutions in the international SOS Network.

Rising Waters Script Development and Pilot

RMC conducted a formative study of the Nurture Nature Center's (NNC) pilot program script, initially titled *Global to Local Flooding and Changing Climate*, using NOAA's Science on a Sphere. The study involved pilot testing the new SOS script with audiences in two sites: Maryland Science Center in Baltimore, MD and the Nurture Nature Center in Easton, PA. In association with piloting the program, RMC conducted four focus groups in July 2011 to provide formative feedback to the program producers. The evaluation focused on refining and testing of the SOS presentation on global warming and flooding. Appendix C includes the protocols used for the formative study.

Focus groups were convened at The Maryland Science Center (MSC) in Baltimore, MD and at the Nurture Nature Center (NNC) in Easton, PA. These locations were selected to reflect the diversity of venues and audiences for which the SOS presentation was developed: the MSC audience group reflected the background and interests of general science center audiences, while groups convened in Easton were assumed to have an understanding of the NNC's orientation to flooding issues.

Participants attended a presentation of the *Global to Local Flooding and Changing Climate* program, completed a written questionnaire, and then participated in a group discussion. Questions focused on the presentation, including particular science content, effectiveness of the visual presentation of the various data sets, and explanatory commentary. The written questionnaire included a series of open-ended questions; in addition, participants were asked to rate each of the data sets/presentation components on a scale of 1-5 (least to most effective). Focus group discussions followed a semi-structured interview protocol and addressed similar topics, as well as general aspects of the presentation, style, and positioning of the Sphere, among others. A total of 55 persons ranging in age from 17 to 74 years old participated in the focus groups. They comprised 26 participants in Baltimore and 27 in Easton.

The script was substantially revised following the feedback from audiences and a professional screenwriter was engaged to strengthen the narrative. The revised script, *Precipitation Trends, Flooding, and Community Resiliency Program*, underwent further testing and analysis. Surveys were developed as follow-up to the earlier pilot test and designed to provide feedback for further refinement of the

program. Forty-three visitors complete surveys following presentations facilitated by various NNC staff members over approximately two weeks.

In its third revision the program was renamed *Rising Waters*. After each pilot test of the SOS presentation, RMC prepared and submitted a summary of findings to NNC staff.

SOS Community Dialogue Forums

A second aspect of the project was a series of community dialogue forums using the SOS program *Rising Waters* to illustrate the physics of rising Earth temperatures, climate change, and flooding. Six SOS events were planned during the course of the project: four at NNC, one at Da Vinci Science Center, and one at the Maryland Science Center. Maryland Science Center volunteered to pilot a forum even though it was outside its scope of work for the project. That forum was cancelled for lack of audience.

Following each forum, participants were asked to complete an evaluation survey. The written questionnaire included both open and closed-ended questions. Open-ended questions asked about the value of the forum including the discussion, importance of the science content learned, understanding of local climate change-related issues, and suggestions for forum improvement. Closed-ended questions included rating scales (least to most effective) about the value of the forum, components of the forum (e.g., presentation, lecture, discussion), and intended follow-up actions. For the most part, survey questions were consistent across the forums. For each survey, wording was adjusted for the specific event and additional questions included if necessary.

RMC also conducted interviews with a small number of participants who attended the NNC forums. On the evaluation survey respondents were invited to participate in an interview two to four weeks after the forum. Those willing to be interviewed provided a contact phone number and email address. The interviews served to learn about interviewees 'additional learning, the influence of the SOS presentation and discussion, and activities interviewees may have engaged in on similar topics since the forum. Table A1 presents the data collected from each forum. Appendix C contains the evaluation surveys distributed after each forum and the interview protocols.

Table A1. Number of Survey Respondents and Interviewees by Forum

Forum Title	Number of survey respondents	Number of respondents interviewed
The Future of Lehigh Valley: What Will Climate Change Mean for Us? (Nurture Nature Center)	57	5
Extreme Weather: Moving from Risk to Readiness (Nurture Nature Center)	30	3
Teaching Weather and Climate Change: A Local and Global View (Nurture Nature Center)	9	2
Lehigh Valley Forum: Local Food Economy (Nurture Nature Center)	55	3
Brainstorm Forum: Global Climate Change (Da Vinci Science Center)	5	NA

After each forum, RMC analyzed the survey findings and prepared a summary report for NNC. In most cases, the evaluation summary was part of NNC's report submitted to decision-makers. Findings across the forums are included in this final evaluation report.

Replication of the SOS Program Community Dialogue Model

A third evaluation activity involved conducting interviews and a focus group discussion with the pilot partners. These discussions elicited the partners' reflections on their evolving understanding and experience of implementing the SOS program using NNC's Community Dialogue Model.

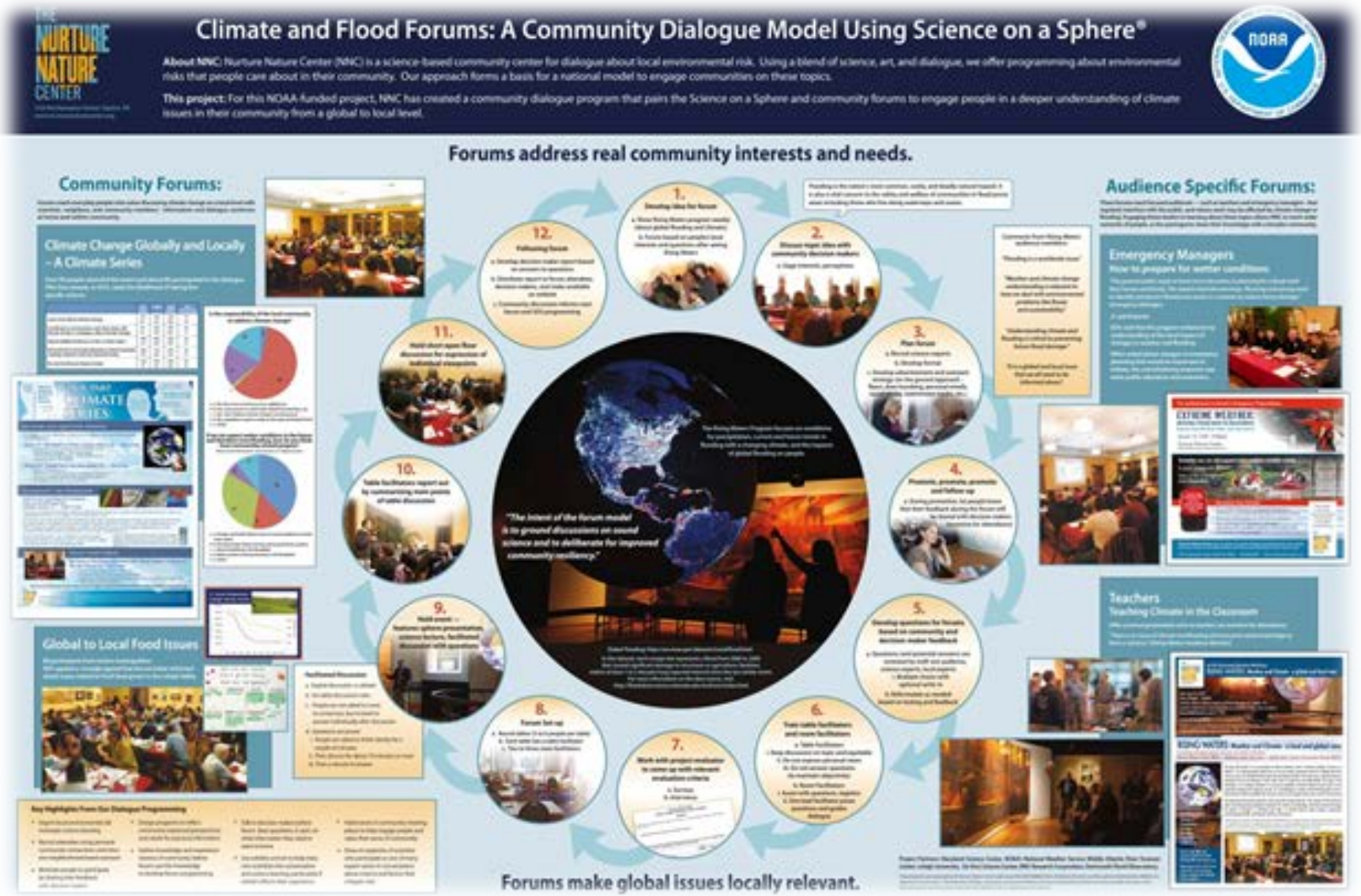
Baseline interviews were conducted with representatives of the Maryland (Jim O'Leary, Senior Director) and Da Vinci (Karen Knecht, Education Manager) Science Centers in the fall of 2011. Both were involved in reviewing the *Rising Waters* script and both exchanged emails and attended meetings over the course of the year to understand the program content. Interview questions focused on their involvement with the project, its similarity to other programs at their respective institutions, anticipated challenges in implementing the model, suggestions for NNC, and ideas for useful training materials. Each interview took approximately 30 minutes. A summary of the interviews was organized around major themes and submitted to NNC.

A second set of interviews was conducted in February 2012 after NNC's first SOS program dialogue forum. RMC interviewed Karen Knecht from the Da Vinci Science Center and Felicia Savage (Education Director) from the Maryland Science Center. Both attended the forum; Karen Knecht served as a table facilitator during the small-group discussions. Interview questions addressed reactions to the forum, what was learned about organizing and conducting forums that could be applied at their respective science centers, and ideas for useful resources and training materials. Each interview lasted 20-30 minutes; a summary was prepared for NNC staff.

A final group discussion was held after the last forum in September 2012 with Karen Knecht from the Da Vinci Science Center, Jim O'Leary from the Maryland Science Center, and Kate Brandes, Rachel Hogan Carr, Keri Maxfield, and Gabrielle Salazar from the Nurture Nature Center. The discussion included reflections on implementing the SOS forum, concerns about adapting the SOS dialogue forum to an institution's mission and identity, adapting the dialogue model to other SOS presentations, and plans for conducting SOS dialogue forums in the future. Jim O' Leary was also asked to reflect on his role as a SOS mentor to NNC. The discussion lasted for two hours; highlights of the discussion are incorporated in the evaluation report.

APPENDIX B: Graphic Representation of SOS Program Dialogue Forum

Graphic Representation of SOS Program Dialogue Forum



APPENDIX C: Survey and Interview Protocols

SOS Pilot Script Protocols

Precipitation Trends, Flooding, and Community Resiliency Program

The program you just saw is still in a pilot phase. We are looking for your feedback to improve it as we prepare to share the program with other science centers that also have a Science on a Sphere (70 in the world). Thanks!

1. How would you describe the Program you just saw? Please select ALL the descriptors that fit your experience of the program.

____ Interesting	_____ Boring	_____ Biased
____ Controversial	_____ Confusing	_____ Clear
____ Engaging	_____ Informative	`_____ Old News
____ Factual	_____ Scary	_____ Repetitive
____ Uninspired	_____ Motivating	_____ Authoritative
____ Slow	_____ Powerful	_____ Important
____ Overwhelming		

Any others? _____

2. How would you describe the main message of the program?

3. The program is designed to address content in the following areas. Please place an "X" to indicate whether you were satisfied with the information provided and/or how it was presented, and provide a brief explanation of your rating in the comments section.

	Not at all Satisfied	Somewhat satisfied	Very satisfied	Comments:
The Science of Precipitation				
The difference between weather and climate				
How climate change is impacting flooding in some parts of the world				
How communities can think about resiliency in the face of flooding				
The current and future precipitation trends				

	Not at all Satisfied	Somewhat satisfied	Very satisfied	Comments:
How a computer model works				
Impacts of flooding on people				

4. Please describe anything that was confusing, or any information that you felt should have been included that was not in the program.

5. Would you recommend this program to others? (Circle ONE) YES NO
    a. Please explain why you would or wouldn't recommend the program, to whom you would recommend it, and/or under what circumstances.

6. Do you have any other suggestions for the Nurture Nature Center about how to improve this program, the facilitation, the seating around the Sphere, or anything else that can help us improve the program?

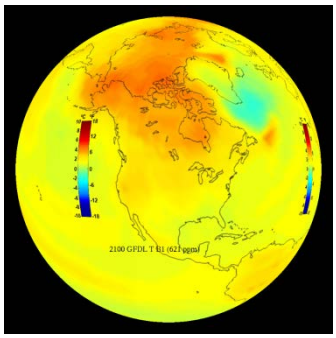
Global to Local Flooding and Changing Climate

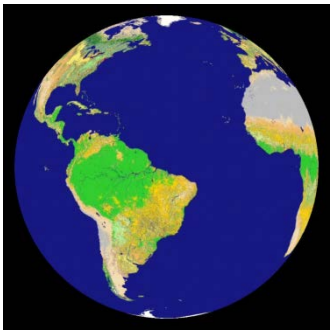
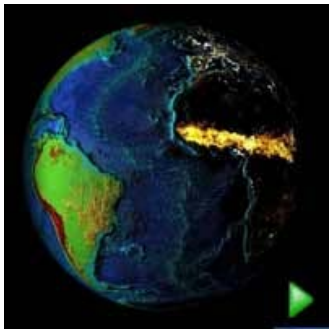
Individual Survey

1. We are interested in learning about your responses to the different sections of the program. Please complete each set of questions for the different Science on a Sphere data sets and other materials presented.

In your responses, please reflect on the clarity and value of the information, images used, colors, explanation provided, terminology, etc. We are interested in which parts of the presentation were most effective and what parts could be improved. Please offer any suggestions you have.

Blue Marble [no image available]	1.	What was the main idea conveyed by this sequence?
	2.	What did you learn from this visual and/or segment of the program?
	3.	What did you find confusing?
Facebook Friendships [no image available]	4.	What was the main idea conveyed by this sequence?
	5.	What did you learn from this visual and/or segment of the program?
	6.	What did you find confusing?

Total Precipitable Water [no image available]	7.	What was the main idea conveyed by this sequence?
	8.	What did you learn from this visual and/or segment of the program?
	9.	What did you find confusing?
Infrared Satellite Over Land 	10.	What was the main idea conveyed by this sequence?
	11.	What did you learn from this visual and/or segment of the program?
	12.	What did you find confusing?
IPCC Temperature Anomaly 	13.	What was the main idea conveyed by this sequence?
	14.	What did you learn from this visual and/or segment of the program?
	15.	What did you find confusing?

Land Cover Map 	16.	What was the main idea conveyed by this sequence?
	17.	What did you learn from this visual and/or segment of the program?
	18.	What did you find confusing?
Surface of Earth and Nighttime Lights 	19.	What was the main idea conveyed by this sequence?
	20.	What did you learn from this visual and/or segment of the program?
	21.	What did you find confusing?
Global Flooding [no image available]	22.	What was the main idea conveyed by this sequence?
	23.	What did you learn from this visual and/or segment of the program?
	24.	What did you find confusing?

Hurricane Track Animation and cumulative Map [no image available]	25.	What was the main idea conveyed by this sequence?
	26.	What did you learn from this visual and/or segment of the program?
	27.	What did you find confusing?
Sea Level Rise [no image available]	28.	What was the main idea conveyed by this sequence?
	29.	What did you learn from this visual and/or segment of the program?
	30.	What did you find confusing?
Flood Stories	31.	What was the main idea conveyed by this sequence?
Easton Participants: Local Flood Stories	32.	What did you learn from this visual and/or segment of the program?
Baltimore Participants: International Flood Stories	33.	What did you find confusing?

Air Traffic

[no image available]

34. What was the main idea conveyed by this sequence?

35. What did you learn from this visual and/or segment of the program?

36. What did you find confusing?

37. What would you say is the overall message of the presentation?

38. How has your understanding of flooding changed?

39. How has your understanding of climate changed?

40. What recommendations do you have for presenters of this program to make it most effective?

41. Easton participants: does the wall art display in the Science on a Sphere room add to how you think about flooding? Does it complement the presentation you just heard?

42. Would you recommend this program? Why or why not? Who would you or wouldn't you recommend it to?

Please tell us about yourself.

Name: Occupation:

Male/Female What is your highest level of education?

Age:

Briefly describe your previous interest/involvement in flooding (or other environmental) issues.

Dialogue Forum Evaluation Surveys and Interview Protocols

Nurture Nature Center
The Future of the Lehigh Valley: What Will Climate Changes Mean for Us?
February 9, 2012
Evaluation Survey

Thank you for participating. Your responses to this survey will help us design future events.

1. What motivated you to attend today's forum?

2. What did you value most about the forum?

3. Please rate your agreement with the following statements about the forum. Choose "strongly disagree," "disagree," "agree," or "strongly agree" in response to each statement.

	Strongly disagree	Disagree	Agree	Strongly agree
The forum matched my expectations.				
The information presented is important for people like me				
I felt comfortable voicing my opinions.				
I am better informed about science concepts related to climate issues.				

4. How did you understanding of climate in the Lehigh Valley change as a result of today's forum?

5. Do you think that your community is prepared for potential changes? ___Yes ____No

   Please explain your answer.

6. How do you think climate change will affect us regionally?

We'd like to know how valuable each forum component was for you. Select "not at all valuable," "somewhat valuable," or "very valuable" for each statement.

	Not at all valuable	Somewhat valuable	Very valuable
Lecture/ Sphere presentation			
Small-group discussion			
Open floor discussion			

7. After attending this forum, how likely are you to: (check ONE box for each)

	Not likely	Likely	Very likely	Not applicable
Learn more about climate change.				
Contribute to conversations and share ideas with friends, family, or colleagues about climate change.				
Attend additional forums on this or other topics.				
Get involved in community planning or attend municipal meetings related to what was discussed today.				
Re-visit the Nurture Nature Center.				

8. What improvement could be made in the forum format or content?

9. Please check any other parts of the Climate Series you attended:

   Climate 101 _____

   Climate 102 _____

   Community Art Workshop _____

10. Would you be willing to participate in a brief telephone interview 2 – 4 weeks from now about the forum? _____Yes _____No
    If so, please write your name and the best way to contact you:

    Name _____Telephone # _____

    Email Address_____

Nurture Nature Center
Extreme Weather:
Moving from Risk to Readiness
March 15, 2012
Evaluation Survey

1. Please describe what you valued most about today's program.

2. Please rate your agreement with the following statements about this event. Choose "strongly disagree," "disagree," "agree," or "strongly agree" in response to each statement.

	Strongly disagree	Disagree	Agree	Strongly agree
a. The forum matched my expectations.				
b. The information presented is important for people like me.				
c. The Science on a Sphere presentation enhanced my understandings of the conditions for precipitation and the potential for increased flooding in our area.				
d. The program enhanced my understanding of the local impact of changes in weather and flooding.				
e. The Program helped me consider other strategies for dealing with weather-related emergencies.				

3. In your capacity as an emergency responder, do you plan to do anything differently to prepare for local flooding? __Yes __ No

3a. If YES, what changes in emergency planning do you think would be important to initiate?

4. What changes in technology do you think would be important to have available?

5 please rate the individual elements of today's program:

	Not at all valuable	Somewhat valuable	Very valuable
a. "Rising Waters" Science on a Sphere presentation			
b. County EM Services Director presentation			
c. National Weather Service presentation			

6. Was anything confusing about the "Rising Waters" Science on a Sphere presentation?
__Yes ___ No

6a. If YES, please describe.

7. What additional information would have been helpful as part of today's program?

8. Would you recommend this program to other Emergency Management personnel in the Greater Lehigh Valley? ____Yes _____No

Nurture Nature Center
Educators' Workshop - *Teaching Weather and Climate Change: A Local and Global View*
April 16, 2012
Evaluation Survey

Thank you for participating. Your responses to this survey will help us design future events.

1. What motivated you to attend today's program?

2. What did you value most about the program?

3. Please rate your agreement with the following statements about the workshop. Choose "strongly disagree," "disagree," "agree," or "strongly agree" in response to each statement.

	Strongly disagree	Disagree	Agree	Strongly agree
The discussion was helpful to me as an educator.				
I am better informed about science concepts related to climate issues.				
Today's program strengthened my understanding of integrating science, art, and dialogue to foster student				
Today's program provided resources and strategies I can apply directly to teaching about climate change in				

4. Please identify how familiar you were with concepts addressed in Rising Waters presentation.

	Concept was new to me	I was already familiar with this concept
Uneven heating of Earth is the fundamental cause of all weather.		
Warm air holds more moisture.		
Total precipitatable water is the amount of water the atmosphere holds that could turn to rain.		
Climate is the synthesis of all weather events on record.		

5. Are you likely to apply what you have learned today in your teaching? ____ Yes ____ No

5a. If yes, please describe how you will apply what you learned.

6. Do you think you would bring students to see the Sphere? ____ Yes ____ No Why or why not?

7. Please tell us how valuable each workshop component was to you as an educator. Select "not at all valuable," "somewhat valuable," or "very valuable" for each statement.

	Not at all valuable	Somewhat valuable	Very valuable
Science on a Sphere presentation			
Facilitated discussion about teaching climate change			
Using art to teach science			
Land Use Workshop			
Climate Change Lecture			

8. After attending today's program, how likely are you to: (check ONE box for each)

	Not likely	Likely	Very likely	Not applicable
Learn more about weather and climate change.				
Use resources you learned about today in your classroom.				
Discuss today's content on teaching climate change with [illegible]				
Connect weather and climate change to local issues.				
Use art to enhance teaching and learning about science.				

9. Was any part of today's forum confusing? ____ Yes ____ No If yes, please explain.

10. What improvement could be made in the programs' format or content?

11. What topics would you like NNC to address in future workshops for teachers?

12. Would you be willing to participate in a brief telephone interview 2 – 4 weeks from now about the forum?
    Yes__ No__

    If Yes, please note the best way to contact you:

Name _____ Telephone # _____ Email Address _____

Maryland Science Center
What Will Climate Change Mean for Us?
DRAFT Evaluation Survey

Thank you for participating. Your responses to this survey will help us design future events.

1. What motivated you to attend today's forum?

2. What did you value most about the forum?

3. Please rate your agreement with the following statements about the forum. Choose "strongly disagree," "disagree," "agree," or "strongly agree" in response to each statement.

	Strongly disagree	Disagree	Agree	Strongly agree
The forum matched my expectations.				
The information presented is important for people like me.				
I felt comfortable voicing my opinions.				
I am better informed about science concepts related to climate issues.				

4. How did you understanding of climate change effects in your area change as a result of today's forum?

5. Do you think that your community is prepared for potential changes? ___Yes ____No

   Please explain your answer.

6. How do you think climate change will affect the region?

We'd like to know how valuable each forum component was for you. Select "not at all valuable," "somewhat valuable," or "very valuable" for each statement.

	Not at all valuable	Somewhat valuable	Very valuable
Speaker Presentation			
Science of a Sphere Presentation			
Small-Group Discussion			
Open Floor Discussion			

7. After attending this forum, how likely are you to: (check ONE box for each)

	Not likely	Likely	Very likely	Not applicable
Learn more about climate change.				
Contribute to conversations and share ideas with friends, family, or colleagues about climate change.				
Attend additional forums on this or other topics.				
Get involved in community planning or attend municipal meetings related to what was discussed today.				
Re-visit the Maryland Science Center				

8. What improvements could be made in the forum format or content?

9. Please list any other climate change related events you have attended:

10. Would you be willing to participate in a brief telephone interview 2 – 4 weeks from now about the forum? _____Yes _____No
    If so, please write your name and the best way to contact you:

    Name _____

    Telephone # _____Email _____

Nurture Nature Center
Lehigh Valley Forum: Local Food Economy
July 26, 2012
Evaluation Survey

Thank you for participating. Your responses to this survey will help us design future events.

1. What motivated you to attend today's forum?

2. What did you value most about the forum?

3. Please rate your agreement with the following statements about the forum. Please choose "strongly disagree," "disagree," "agree," or "strongly agree" in response to each statement.

	Strongly disagree	Disagree	Agree	Strongly agree
The forum matched my expectations.				
The information presented is important for people like me.				
I felt comfortable voicing my opinions.				
I am better informed about issues related to fresh food grown in the Lehigh Valley.				

4. We'd like to know how valuable each forum component was for you. Please select "not at all valuable," "somewhat valuable," or "very valuable" for each component.

	Not at all valuable	Somewhat valuable	Very valuable
Community Art Exhibit, Food for Thought			
Science on a Sphere Film			
Lynn Prior's Presentation			
Small-Group Discussion			
Open Floor Discussion			

5. Did the Science on a Sphere film give you a global perspective on farming and food resources? Yes__ No __

6. If so, did having a global perspective help you in your discussion of local food issues during the forum discussion? Yes__ No __

7. How did your understanding of local issues related to farm land and fresh food sources change as a result of today's forum?

8. After attending today's forum, how likely are you to: (please check ONE box for each)

	Not likely	Likely	Very likely	Not applicable
Learn more about Lehigh Valley food issues.				
Contribute to conversations and share ideas with friends, family, or colleagues about local food issues.				
Attend additional forums on this or related topics.				
Learn more about the Lehigh Valley Fresh Food Access Plan.				
Get involved in community decisions about land use, local agriculture, or related issues.				
Revisit the Nurture Nature Center.				
Attend more Science on a Sphere films or presentations				

9. Did you value knowing that your feedback during the forum will be used to help inform the Lehigh Valley Fresh Food Access Plan? Why or why not?

10. What improvements could be made in the forum format or content?

11. Additional comments:

12. Would you be willing to participate in a brief telephone interview 2 – 4 weeks from now about the forum? _____Yes _____No

    If so, please write your name and the best way to contact you:

    Name _____

    Telephone # _____Email _____

Da Vinci Science Center
Brainstorm Forum: Global Climate Change
September 18, 2012
Evaluation Survey

Thank you for participating. Your responses to this survey will help us design future events.

1. What motivated you to attend today's Brainstorm Forum?

2. What did you value most about the forum?

3. Please rate your agreement with the following statements about the forum. Please choose either "strongly disagree," "disagree," "agree," or "strongly agree" for each statement.

	Strongly disagree	Disagree	Agree	Strongly agree
The forum matched my expectations.				
The information presented is important for people like me.				
I felt comfortable voicing my opinions.				
I am better informed about global climate change and its local effects				

4. We'd like to know how valuable each forum component was for you. Please select "not at all valuable," "somewhat valuable," or "very valuable" for each component.

	Not at all valuable	Somewhat valuable	Very valuable
Dr. Dork Sahagian's Presentation			
Science on a Sphere Film			
Small-Group Discussion			
Open Floor Discussion			

5. Did the Science on a Sphere presentation contribute to your understanding of global climate change?
___Yes ___No

6. If so, how did having a global perspective help you in your discussion of local climate change impacts during the small-group discussion?

7. Do you think that your community is prepared for potential climate-related changes?
___Yes ___No Please explain why or why not.

8. After attending today's forum, how likely are you to: (please check ONE box for each)

	Not likely	Likely	Very likely	Not applicable
Learn more about climate change.				
Contribute to conversations and share ideas with friends, family, or colleagues about climate change.				
Attend additional forums on this or related topics.				
Learn more about the Lehigh Valley Planning Commission's comprehensive plan.				
Get involved in community planning or attend meetings on climate change and local impacts.				
Attend another Da Vinci Brainstorm Forum.				
Revisit the Da Vinci Science Center.				

9. Did you value knowing that your feedback today will be reported to the cities of Allentown, Bethlehem, and Easton, and the Lehigh Valley Planning Commission? Why or why not?

10. How did you hear about today's forum? Check all that apply.
Email
Flyer
Facebook
Twitter
Da Vinci Center website
Word of mouth
Radio
Other—please describe

11. What improvements could be made in the forum format or content?

INTERVIEW PROTOCOL: NNC 2/12 CLIMATE CHANGE FORUM

Date: Interviewer:

1. *How long have you lived in the community?*

2. *Have you been part of community discussions about local issues?*

3. *How high is this issue – climate change - on your radar of concerns? (probe: has this always been an issue of concern or is it newer?)*

4. *What message or idea has stayed with you since the Forum?*

5. *Did your beliefs change? Do you look at the issue differently now?*

6. *Have you talked with your neighbors, friends, relatives, colleagues about this issue? Probe: What was the content, was it an in-depth conversation about the issue, etc.*

7. *Now that you have been exposed to this Forum, do you see yourself taking any actions, or doing something differently, to address climate change? Such as attending planning meetings, letters to the editor, joining an environmental org, joining Sierra Club, etc.*

8. *If Yes, what have you done or think about doing?*

INTERVIEW PROTOCOL: NNC 3/12 EMERGENCY MANAGERS FORUM

Date: Interviewer:

1. *What is your background in emergency management? Your current position?*
2. *What was your biggest "take-away" from the forum?*
3. *How effective was the forum for you as a way to get professional information?*
4. *Did the Rising Waters Science on a Sphere presentation enhance your understanding of flooding issues? How?*
5. *If NNC offered community education on flood preparation, how would you see yourself participating?*

INTERVIEW PROTOCOL: NNC 4/12 EDUCATORS FORUM

Date: Interviewer:

1. *What subject and grade level do you teach?*

2. *Have you taught or co-taught about science and climate change before? In what context? What challenges arose in teaching climate change?*

3. *What aspect of the workshop was most useful to you?*

4. *How do you see using what you learned today in your teaching? Art? Maps?*

5. *After today's forum, do you look climate change differently? Will you teach about it differently?*

6. *Have you talked with colleagues about this issue? Probe: What was the content, was it an in-depth conversation about the issue, etc.?*

7. *What message or idea has stayed with you since the Forum?*

INTERVIEW PROTOCOL: NNC 7/12 LOCAL FOOD ECONOMY FORUM

Date: Interviewer

1. *How long have you lived in the Lehigh Valley?*

2. *Have you been part of other community discussions about local issues? Which discussions?*

3. *How high is the issue of local food security among your concerns? (probe: has this always been an issue of concern or is it newer?)*

4. *Although the Science on a Sphere film malfunctioned, did you find any of the maps or information displayed useful for the dialogue? What did you find useful? How was it useful?*

5. *What message or idea has stayed with you since the Forum?*

6. *Do you look at the issue differently now? Did any of your beliefs change?*

7. *Have you talked with your neighbors, friends, relatives, colleagues about this issue? Probe: What was the content, was it an in-depth conversation about the issue, etc.*

8. *Now that you have been exposed to this Forum, do you see yourself taking any actions, or doing something differently, to address climate change? Such as attending planning meetings, letters to the editor, joining an environmental org, joining Sierra Club, etc.? If Yes, what have you done or think about doing?*

Pilot Partner Interview Protocols

Nurture Nature Center SOS Program Forum
Baseline Partner Interview Protocol
Fall, 2011

1. Please describe your involvement in the project thus far.

2. What do you hope to get out of this partnership?

3. How does this project different from past or ongoing work at your institution related to Flooding? Community Forums? Use of SOS/ Magic Planet?

4. How, if at all, has your thinking about the issues of flooding and climate change been affected by your involvement in this project?

5. What challenges do you foresee moving forward related to SOS Presentation? Forum Development at Your Site?

6. What suggestions do you have for NNC in preparing training for facilitators in the flood and climate change program? What kinds of training materials would be most useful to you?

7. What kinds of resources (e.g., images) would be useful for you in providing a local perspective ib these issues?

Nurture Nature Center SOS Program Forum
Post-NNC Forum 1 Partner Interview Protocol
February, 2012

1. What were your reactions to the February 9 SOS forum at the NNC. (Consider the presentation, forum, set-up, speaker, etc.) Was it what you expected? Did anything surprise you?

2. What did you learn about organizing an SOS forum? Did observing the forum clarify the process for you? Did it raise new questions? If so, what questions do you have?

3. How will you use what you learned at the NNC forum to shape forums at your institution? What adaptations will you need to make?

4. What do you hope to accomplish by holding an SOS forum?

5. What additional resources or information do you need from NNC to produce a forum and/or present Rising Waters?

Nurture Nature Center SOS Program Forum
Final Partner Interview Protocol
September, 2012

1. What are your reflections on your experience with the SOS forum in your institutions? What was the greatest challenge? Your point of greatest learning?

2. What plans do you have for conducting one or more SOS forums in the future?

3. How does the SOS forum align with your institution's identity and mission? Is it a "stretch" from more usual programming? What are the implications for your staff of conducting an SOS forum?

4. How essential is the climate change element in this model? Do you see your institution adapting NNC's forum model to other SOS presentations?

5. How do you see involving local or regional decision-makers in the SOS forum model?

6. (For Maryland Science Center representative) Would you please reflect on your role as an SOS mentor to NNC?