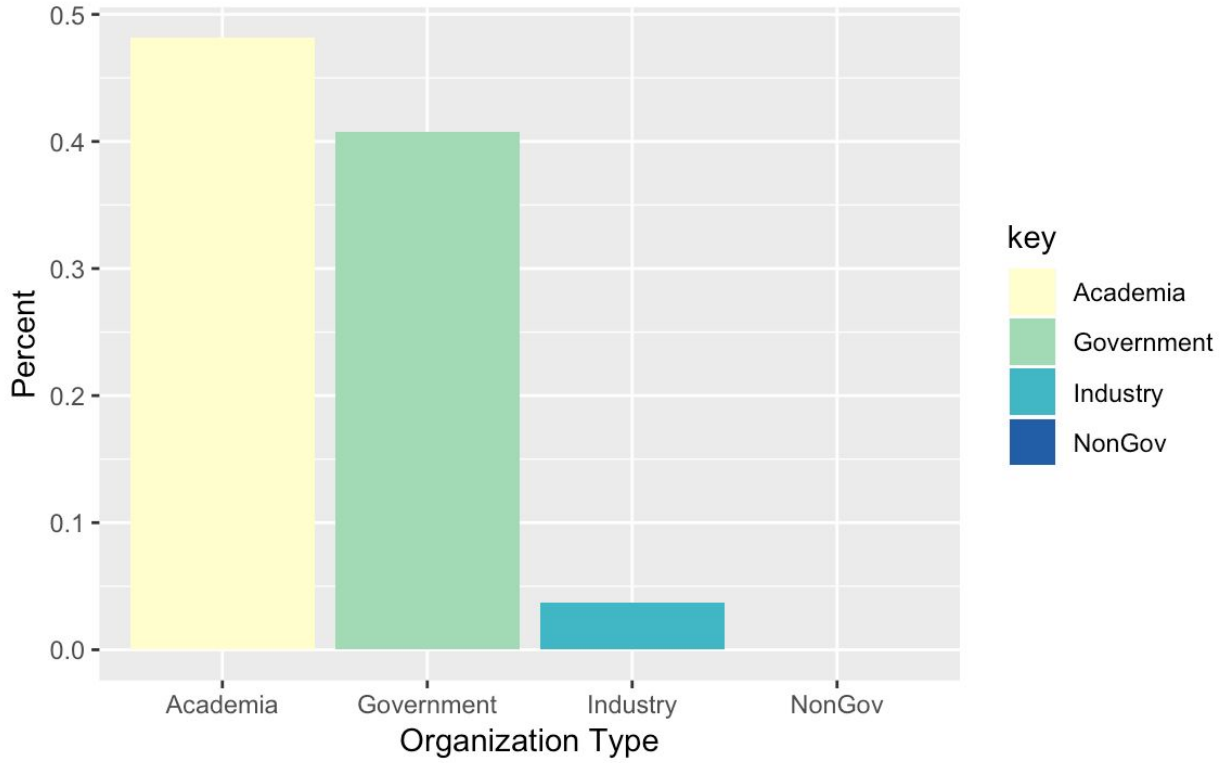
TomorrowNow Workshop 1 Report May 2018

Ross Meentemeyer, Helena Mitasova, Todd Bendor, Kevin Foy, and Corey White

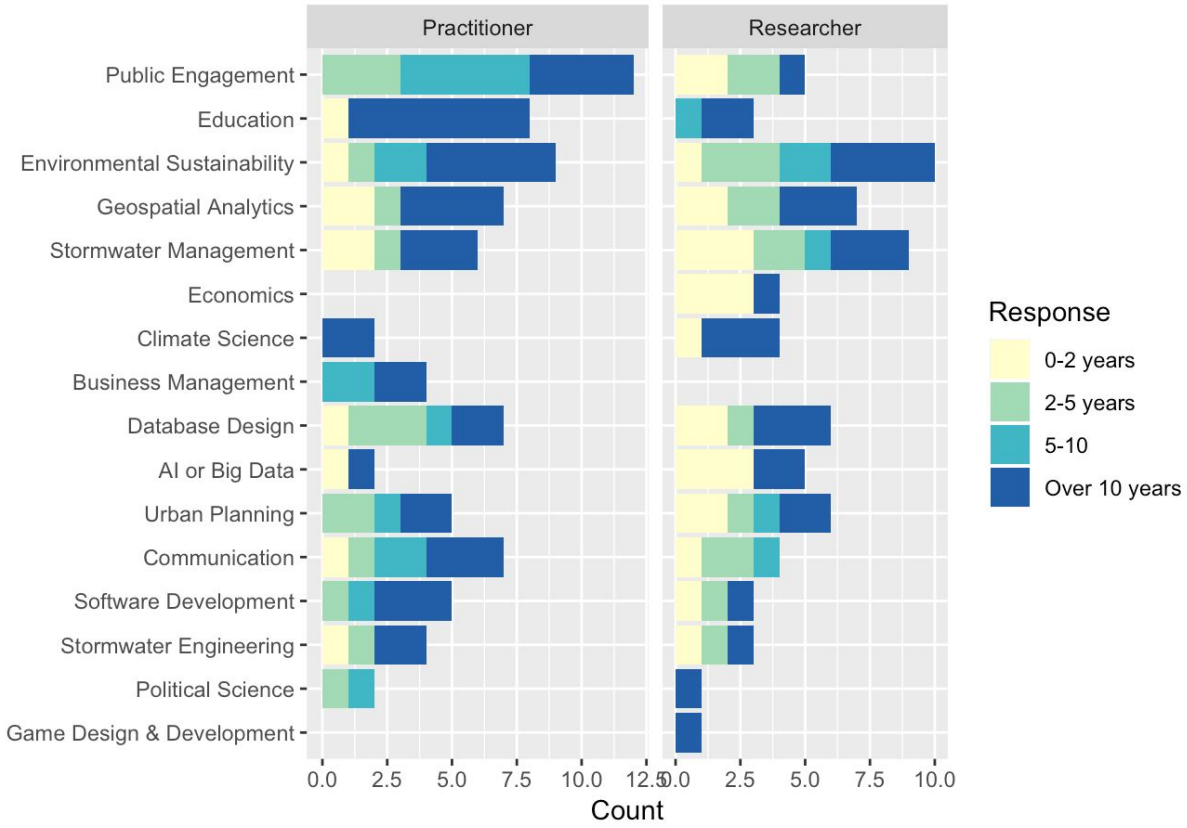
The first TomorrowNow workshop held at North Carolina State University Center for Geospatial Analytics in May 2018 consisted of **24 professionals** from around the Triangle region. The workshop participants included government employees, academics, and one individual from industry (Figure 1). The participants were asked to complete both pre- and post-workshop surveys to identify who was participating and gauge overall interest in helping develop the TomorrowNow project. The workshop survey also aimed to identify which stormwater issues are facing the Triangle, the barriers to fixing these issues, and strategies that can be taken to overcome these barriers.

Figure 1. Organizational Affiliation



In the pre-workshop survey, a large portion of the participants self-identified as experts in stormwater management, environmental sustainability, geospatial analytics, urban planning, stormwater engineering, public engagement, and software development. No participant self-identified as having experience as a practitioner in game design/development, economics, or as having experience in business management research (Figure 2). The lack of experience in game design and development as a practitioner could be

Figure 2. Professional Experience Level



an obstacle for the development of TomorrowNow, but is also an opportunity to **expand recruitment to people in the gaming industry**.

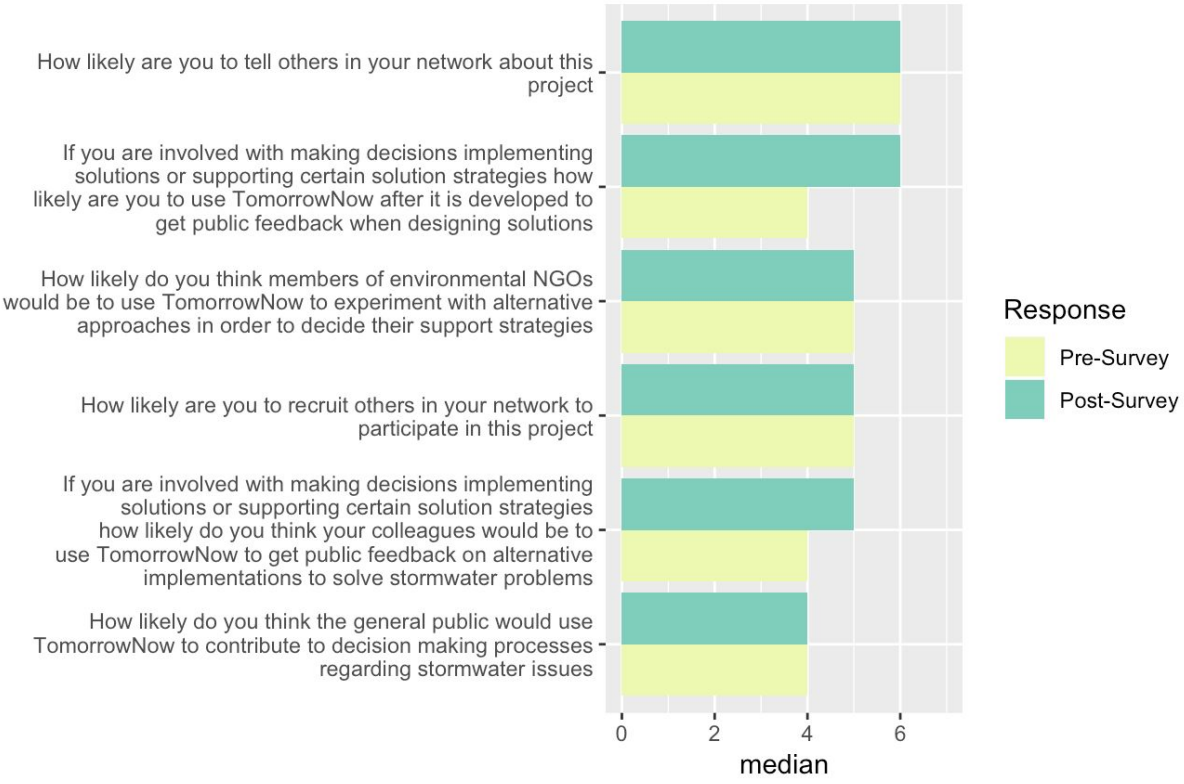
Perceptions

"Civic engagement hinges on a sense of ownership." - Workshop Participant

The likelihood of participants to share project information with their network and recruit others to participate in TomorrowNow was higher in the post-workshop survey than the pre-workshop survey. The participants also reported a **higher likelihood to use TomorrowNow to get feedback from public audiences after the workshop**, indicating that the meeting provided them with a better understanding of how TomorrowNow could be used for this purpose. However, the participants were unsure if the public would use TomorrowNow to contribute to the decision-making processes regarding stormwater (Figure 3).

Figure 3. Based on What You Know

1: Not Likely - 7: Very Likely

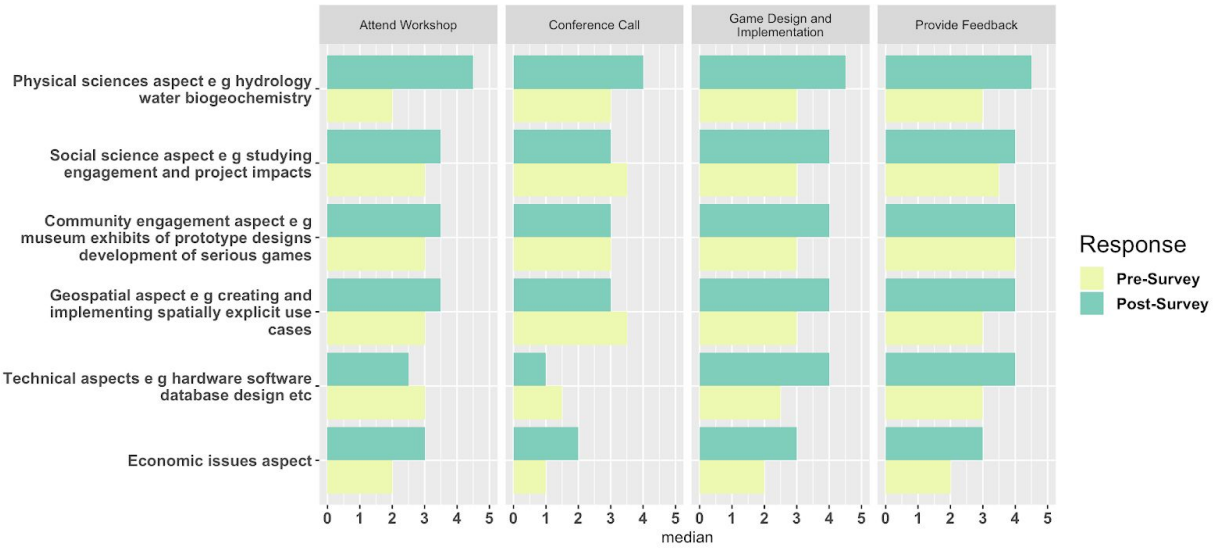


Interests

The participants of Workshop 1 were asked before and after the workshop about their interest in helping design or develop TomorrowNow. The levels of participation available to the participants were conference calls, workshops, providing feedback on drafts/general advice, and system/game design and implementation (Figure 4). The majority of interest in participating in conference calls focused on the **physical and social science aspect** of the project; the least amount of interest in conference calls concerned technical and economic areas. Between the pre- and post-workshop surveys, interest in participating in workshops related to **physical sciences** (e.g., hydrology, water biogeochemistry) more than doubled. Attendees were also more interested in attending future workshops related to **geospatial, social science, and community engagement** after the workshop than before; however, participants were less interested in attending future workshops related to the technical aspects of TomorrowNow. Participants were most interested in providing feedback or general advice on issues related to **physical science, social science, community engagement, technical aspects, and geospatial aspects** of TomorrowNow. As a means of participating in TomorrowNow development, game design and providing feedback had the **overall most interest** from attendees in Workshop 1.

Figure 4. Interest in Particpation

1: Not Interested - 5: Extremely Interested



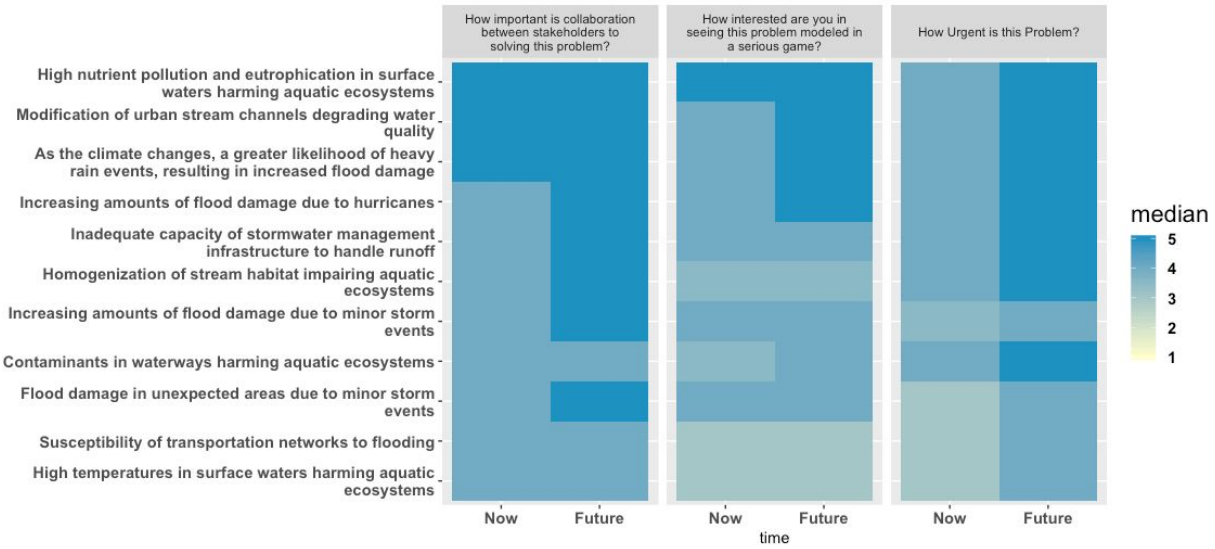
Participants were most interested in participating in conference calls, workshops, providing feedback, and game design and implementation related to **physical science aspects** of TomorrowNow. The participants indicated that they were less interested in helping with the technical and economic aspects of TomorrowNow. However, the participants did indicate a high interest in providing support in these areas through feedback and advice and in game design and implementation. Overall, participants were more interested in helping in all aspects of TomorrowNow after they completed the workshop, and the results are reflective of the listed experience levels of the participants.

Stormwater Issues in the Triangle

The participants of Workshop 1 were asked to give their opinions about the current stormwater issues facing the Triangle. The questions were framed as: *how important is collaboration* to address the problem, *how interested* are the participants in seeing these problems modeled as a serious game (e.g. TomorrowNow), and *how urgent* is the problem (Figure 5). Participants indicated that the stormwater issues most threatening the Triangle in the future are **high nutrient pollution and eutrophication in surface waters harming aquatic ecosystems, modification of urban stream channels degrading water quality, and climate change resulting in increased damage from flooding**. In response to an open-ended prompt to identify problems additional to those listed in the survey, participants identified issues around environmental justice and equitable outcomes. **In future workshops, these topics should be included to better understand how they could be modeled in TomorrowNow.**

Figure 5. Stormwater Problems in the Triangle

1: Not, 2: Little, 3: Moderately, 4: Very, 5: Extremely



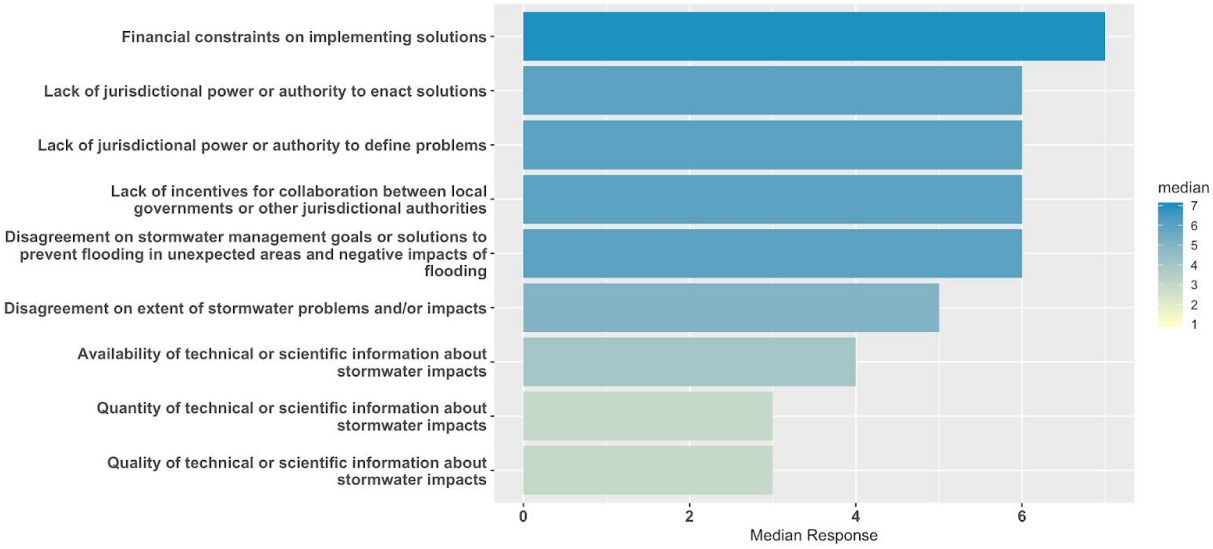
Barriers to Determining and Implementing Solutions

"*There's a lot of exchange between city governments, but that does not mean collaboration for solutions. For Durham and Raleigh, the best collaboration comes when imposed by law." - Workshop Participant*

Workshop participants indicated that the biggest barrier to determining and implementing a solution to the stormwater issues facing the Triangle is **financial constraints**. Other barriers included a **lack of jurisdictional power or authority** to both enact solutions and define problems, as well as a **lack of incentives for collaboration** between local governments or

Figure 6. Barriers Facing Stormwater Management

1: Not a Barrier - 7: Major Barrier



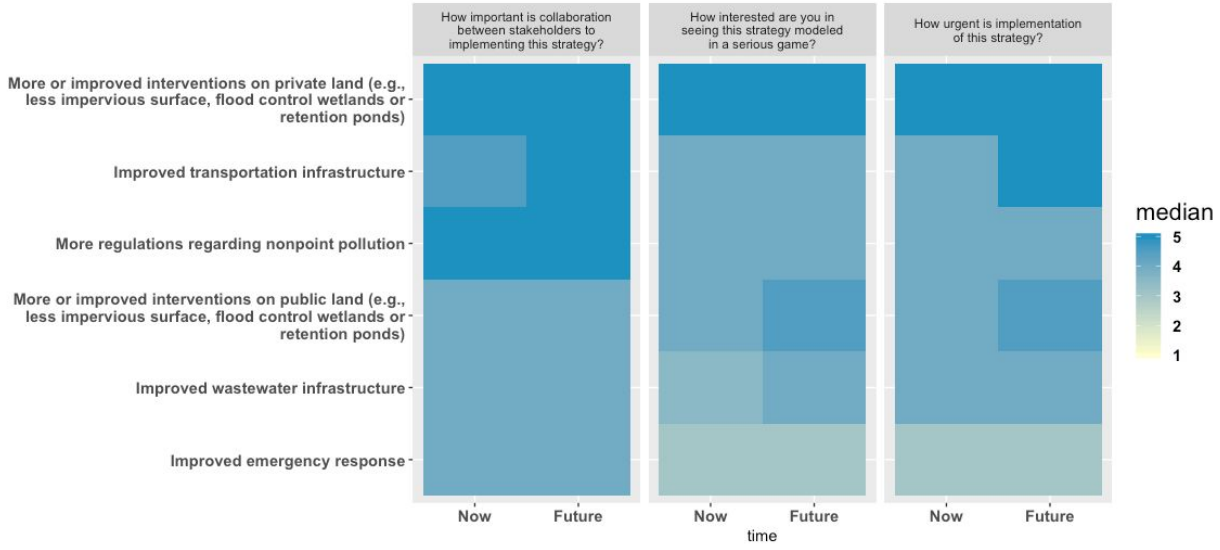
other jurisdictional authorities, and **disagreement on stormwater management goals** or solutions to prevent flooding in unexpected areas (Figure 6).

Potential Strategies to Help Solve Stormwater Management

"*How much do we want to drive policy vs. citizen education?" - Workshop Participant*

Workshop participants identified increasing or improving **interventions on private land** (e.g., less impervious surface, more flood control wetlands or retention ponds) as the most important strategy to help solve stormwater management issues in the Triangle (Figure 7). Strategies involving improved wastewater infrastructure and improved emergency response were deemed of little to moderate importance, indicating their low priority for inclusion in the TomorrowNow game.

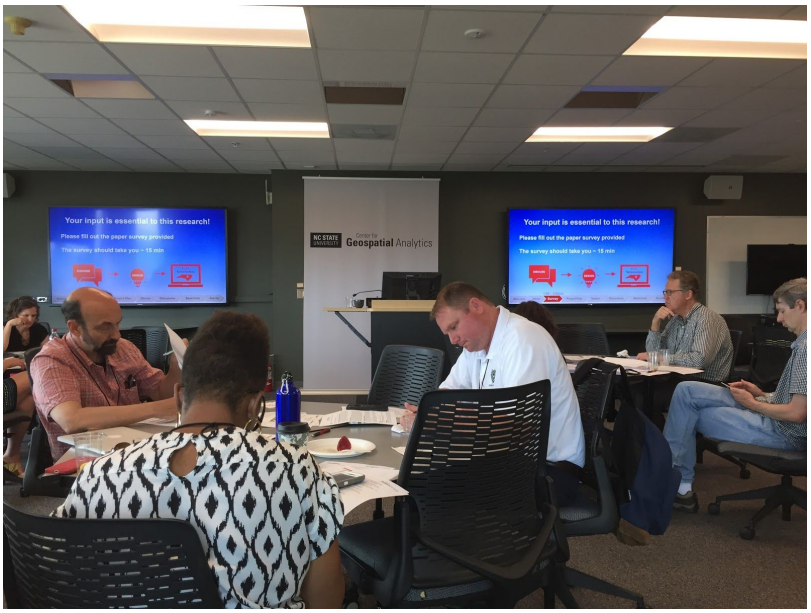
Figure 7. Strategies to Solve Stormwater Management
1: Not, 2: Little, 3: Moderately, 4: Very, 5: Extremely



Discussion and Recommendations

The results of Workshop 1 indicate interest in TomorrowNow among stakeholders and clearly identify issues facing the Triangle on which TomorrowNow can focus to help improve stormwater management. So far, though, project participants mainly consist of government employees and academics, which likely influences survey findings and project priorities. **Recruitment efforts should increase to attract members from industry and NGOs, to encompass a broader view of stormwater issues in the Triangle**. In addition to recruiting participants from different organizations, a focus should be placed on **identifying and engaging experts in the game industry and economics**. Overall, participants in Workshop 1

were most interested in helping with the **physical science** aspects of TomorrowNow regardless of the type of participation (e.g., attend a workshop, conference call, game design, and providing feedback).



Stormwater issues facing the Triangle region now and in the future were identified as **high nutrient pollution and eutrophication in surface waters harming aquatic ecosystems, modification of urban stream channels degrading water quality, and climate change resulting in increased damage from flooding.** However, participants indicated that the survey was missing questions about the environmental justice aspects of stormwater management, which they felt were extremely important. **Additional workshops should focus on how these issues can be gamified and identify the spatial and temporal scales of TomorrowNow**.

Discussion at Workshop 1 briefly touched on the data needs of TomorrowNow and the complexity of its modeling efforts. In particular, participants cautioned against presenting the game as a source of conclusive answers but rather viewed it as a useful tool for weighing different outcomes:

"A policy-maker could think the game presents 'the solution' because of oversimplification, and not understand that complexity has been reduced. Because some things are harder to predict than others. We should be very careful about what goes into the game." - Workshop Participant

"Elected officials say 'we need more data to make decisions' but if this [game] is a better way to learn *about trade-offs and graceful failure, I think that that could be really valuable." - Workshop Participant*

Funding was the main hurdle identified as restricting the implementation of stormwater solutions in the Triangle during Workshop 1. However, **disagreement on stormwater management goals or solutions to prevent flooding in unexpected areas and negative impacts of flooding** presents a more plausible focus for TomorrowNow.

Summary of Future Directions

The results of Workshop 1 indicate that future work on TomorrowNow should address developing scenarios and problem-solving strategies for the following issues in the Triangle:

- High nutrient pollution and eutrophication in surface water harming aquatic ecosystems
- Modification of urban stream channels degrading water quality
- Increased flooding due to climate change
- Social inequity in the impacts of water quality degradation and flooding

Results also suggest that the game's strategies should focus on the following approaches:

- Improving land interventions on private land
- Improving land interventions on public land
- Improving transportation infrastructure
- Modeling the effects of changes in regulations regarding nonpoint pollution

Furthermore, Workshop 2 should address the plausibility of gamification, identify data needs, and define appropriate spatial and temporal scales, as the next steps towards the development of a prototype.