Triagency Meeting
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Great Lakes Climate Change Science and Education Systemic Network

Working Model of Strategic Plan

Key Personnel	Institution
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Scientist White Paper

Top 10 regionally-specific climate effects

1. Higher air temperatures, especially increases in winter temperature, have already been observed in the Great Lakes region and the growing season has already been extended by more than a week. Further increases in temperature, including summer heat waves, will likely have negative economic and health impacts.
2. Both frequency and intensity of severe storms has been increasing in the Great Lakes region and this trend is expected to become more pronounced in the coming decades. An increase in the intensity of severe storms will have a strong negative impact on the economy of the region due to resulting damages, increased preparation for the events, cleanup costs, business disruption, and altered building codes.
3. Both extent and duration of Great Lakes ice cover has decreased in recent decades and are expected to continue to decrease. This may effect lake circulation patterns, lake water levels, fisheries and maritime transportation.
4. The Great Lakes region is expected to become drier overall due to increasing temperatures and evaporation, as well as more frequent droughts, which could affect soil moisture, surface waters and groundwater supply. The effect will be felt most strongly in summer, creating greater potential for conflicts of limited water resources and potentially costly necessary changes in water supply distribution.
5. Great Lakes water levels have been rising and falling (seasonal pattern) approximately one month earlier than they were in the late 19th Century.
6. In the future, lake temperatures are predicted to increase earlier in the spring season, reach higher temperatures in the summer, and cool more slowly in the fall. This could result in longer stratification, decreased mixing, and increased potential for development of dead zones.
7. Direct and indirect effects of climate change will likely have negative impacts on water quality. Erosion will likely increase (due to shifting water levels and ice cover along with increased storms), combined sewer overflows will be more frequent (due to increased storms), wetland loss (due to evaporation increases) will decrease natural filtration, contaminated sediment resuspension (due to circulation shifts) will return legacy pollutants to the system, etc
8. The Great Lakes region has already experienced one of the greatest decreases in snow depth in North America - snow cover is anticipated to continue to decline with consequences for winter recreation and transportation.
9. Populations of recreationally important coldwater fish species, such as trout, bass, and sunfish, are already stressed and could become more so under a warmer climate, which would generally lead to a loss of fish diversity
10. The number of heat waves, days over 90°F, and heat-related illnesses and deaths are likely increase in the Great Lakes region. Increased humidity will make hot days feel even hotter and could further impact human health. Warmer temperatures can create more ground-level ozone, which could increase respiratory illnesses.

Strategic Plan

- Connect educators with scientists. Both formal and informal educators feel the need to ground their educational materials in science. Problems of information overload make it difficult to accurately vet resources. However, establishing strong ties to scientists could provide educators with a personal network rich in accurate and credible climate change materials.
- Provide materials and content specific to Great Lakes and local contexts. Over and over again, educators told us there is a gaping hole in resources focused on Great Lakes and local contexts, from raw data on climate and environmental changes to fully formed lesson plans.
- Build or identify teaching frameworks for climate change education, based on audience attitudes and motivations. Because varying audience attitudes influence what content and approach works best, there is need for clear frameworks for teaching climate change that take those audience variances into consideration. These frameworks could help educators more easily craft tailored messages for their audiences. Additionally, they could help ground messages in solid pedagogy for climate change education.
- Leverage science center and museum audiences. While informal educators face the inherent challenge of selective attention from audiences in these "free-choice learning environments", there is promise in venues such as science centers and museums to reach a diverse audience group who may not intentionally be seeking out climate change education.

Education White Paper

Top 10 regionally-specific barriers and gaps

1. Improve climate change content knowledge in K-12 teachers, science education professors, and journalists.
2. Communication and education programs are most effective when targeted to specific audiences; therefore, treating "the public" as a homogenous group is a barrier in and of itself (CCEP-I: In Person Focus Group).
3. Science center visitors generally reflect the diverse range of opinions in the general population in terms of climate change perceptions. From the the 6 Americas Survey, we see museums serving a diverse audience in terms of attitudes, beliefs and perceptions towards climate change. We noted that science centers see a slightly larger segment of Concerned and Alarmed visitors.
4. Teachers identify one of the biggest barriers to teaching climate change as student (and parent) skepticism and misconceptions (Johnson, 2011)
5. Effective framing of climate change and selection of content can be highly dependent on the user's individual position regarding climate change. Audiences who are skeptical or unsure of climate change want to see how science/scientists work. Those who are sure what to see action and efforts to reduce global warming (McCracken, 2009).
6. Previous focus group research shows discrepancies in what adults consider reliable information sources. For example, some distrust government and university agencies; others consider them quite reliable.
7. Participants generally agreed that there is plenty of information available and in fact noted that they are dealing with 'information overload'. The plethora of politicized information which is based in rhetoric or opinion rather than fact was noted as impeding the capacity of intermediaries to access scientifically-based information. For teachers, information overload results in a feeling that the resources are 'out there' but cannot be located, either because of lack of time or motivation or because teachers don't know where to go (CCEP1: In Person Focus Group).
8. While educators feel the burden of information overload for climate change materials generally, they identified a significant lack of resources specific to the Great Lakes or to local environments and contexts. Focus group participants felt that the best way to communicate to the public audience was to make climate change relevant at the local, issue-specific level (CCEP I: Online Workshop).
9. As educators discussed vetting the plethora of climate change information available to them, they talked about the need to separate the science from the politics. This is important to them to personally know what resources are accurate, and to build credibility with their audiences. Teachers identified a need to move beyond just climate change information to packaged materials, activities and lessons plans ready for them to use in their classrooms. Teachers noted that climate change isn't in the textbooks (Online Workshop). It is also more difficult to find good classroom activities than simply education resources (Johnson, 2011).
10. Teachers feel less connected to the science community, but see great value from establishing this link. Teachers identified a need for liaisons between climate scientists and educators and expressed interest in more materials such as the webinar featuring a climate scientist (Online Workshop). Teachers place a high value on face time with scientists (Buhr, 2011).

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