



2019 GLISA Small Grant White Paper

Climate Change Opportunities: Defining Methodologies, Challenges, and Opportunities for Anticipated Growth in the Great Lakes Region

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Acknowledgments



AMERICAN SOCIETY OF
ADAPTATION PROFESSIONALS

Climate Migration Workshop
Preparing Receiving Communities

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Background and Approach

BACKGROUND, MOTIVATION, AND GOALS

In 2018, a stunning series of climate-fueled disasters led to the complete loss of two U.S. cities, Paradise, CA and Mexico Beach, FL, and the first complete corporate loss from climate change, as PG&E filed chapter 11. Furthermore, the utter lack of response from federal and most state policy makers reinforces the reality that the impacts of climate change are going to continue to increase in severity and cost (to human lives, ecosystems, and economies).

However, in addition to recognizing the threats and negative impacts of climate, it is also necessary for communities, states, and regions to recognize where they may be positioned to benefit under a changing climate regime, and begin planning appropriately to capitalize on benefits and manage growth in a way that is rooted in equity and justice.

We are already seeing speculative land purchasing by the soybean and corn industry throughout the Great Lakes region, breweries from the west are actively seeking out water-rich production facilities, and the combination of cost and risk in places like California, Arizona, and Florida is driving shifts in real estate investment to new markets. All of this contributes to a unique opportunity to address where infrastructure, social services, and ecosystem services are currently falling behind, and position Great Lakes states, communities, and businesses to springboard into a future of economic success. This positioning requires understanding stakeholder perceptions and needs, including those of local, state, and tribal governments and business leaders in key economic sectors such as agriculture. It also requires new models and methods to predict and respond to changes in demographics and other key conditions that establish the region's ability to take advantage of climate-related opportunities.

With funding from GLISA's small grant program, The American Society of Adaptation Professionals (ASAP) created this project to help begin to prepare the Great Lakes region holistically for both the negative and positive impacts of climate change and contribute to the region moving into a period of socially just and environmentally sound growth. The project goals were to:

- Support GLISA in building a foundation to understand how to pursue work on in-migration;
- Catalyze additional investment and research into the topic of in-migration and regional preparedness; and,
- Introduce a new narrative around climate change that focuses on potential benefits and opportunities, rather than negative impacts and risks.

PROJECT TEAM COMPOSITION

The project team was comprised of ASAP staff and several applied researchers:

- ASAP staff: created literature review documenting needs and opportunities with respect to in-migration to the Great Lakes region; design and execute convening of practitioners and applied researchers to create momentum and build knowledge on the topic of in-migration; convene demographers and climatologies to co-create methodologies for predicting climate-induced in-migration to the Great Lakes.
- Matt Hauer (Florida State University): design a rigorous and replicable methodology for projecting demographic changes that integrates future climate projections.
- GLISA (Kim Channell, B.J. Baule): participated in the climate migration methodology team and the methodology learning lab; provided gridded climate data for the methodology on projected demographic changes; provided connections to end users working out of the University of Michigan.

SUMMARY OF PROJECT APPROACH

This project used a two-pronged approach to help prepare the Great Lakes region for climate migration.

1. We worked with demographers, climatologists, and applied social scientists to accelerate the development of methodologies to assess, predict, and prepare for climate migration through a Climate Migration Methodology Accelerator. The Accelerator, which was jointly supported by GLISA and the New York State Energy Research and Development Authority (NYSERDA), offered an opportunity for multidisciplinary teams and other applied researchers, including ASAP members from across North America, to share results and seek feedback on methodology development. Accelerator teams focused on a range of topics, including the correlation between temperature and migration, housing availability in the context of climate risk and migration responses, and the relationship of community amenities to migration choices. ASAP also facilitated meetings between research teams and potential end users to help inform useful and usable science production.
2. Concurrently, ASAP led focus group conversations with stakeholders in the Great Lakes region to understand the diverse array of perspectives on in-migration and support knowledge development on this topic. Intermediary organizations, many of whom are ASAP members, helped us identify participants. Adaptation professionals within and outside the ASAP network have been exposed to the new knowledge and enhanced understanding on climate migration these projects created by participating in outreach opportunities such as the December 2021 Preparing Receiving Communities [workshop](#) and media engagement in outlets across the U.S.

Relationships

ASAP-GLISA RELATIONSHIP

Prior to the project, ASAP had a strong working relationship with GLISA through collaboration on the Great Lakes Adaptation Forum (GLAF) and Beth Gibbons (ASAP Executive Director)'s former employment with GLISA. GLISA provided a high level of support to the project, particularly via GLISA staff Kim Channell and BJ Baule, participating on a climate migration methodology team and being regular participants in the methodology learning lab. GLISA also provided connections to end users working out of the University of Michigan. We continue to have a strong relationship with GLISA and hope to continue working with GLISA through their small grants program, GLAF, and other potential collaborations.

STAKEHOLDER NETWORKS ENGAGED

In addition to Hauer and GLISA staff mentioned above, we engaged 15 additional applied social scientists from academic and non-profit institutions to provide insight in the methodology development process and during methodology learning labs. We engaged with the ASAP Climate Migration and Managed Retreat group leadership team, which includes 5-7 ASAP members from the academic, nonprofit, public, and private sectors. Representatives from National League of Cities, City of Ann Arbor, National Wildlife Federation, Michigan Municipal League, Great Lakes Climate Adaptation Network, Northern Institute of Applied Climate Science, 1854 Treaty Authority, Great Lakes Indian Fish and Wildlife Commission, Freshwater Future, We The People of Detroit, MI Department of Health and Human Services, and Chippewa Ottawa Resource Authority provided insight for our literature review and typology of stakeholder needs. We engaged with other GLISA grantees via quarterly calls organized by GLISA.

Use of Climate Information and Services

We anticipated using both climate observations and predictions from the Great Lakes region and other regions across the U.S. We anticipated using observational data from the past ten years and climate projections for 30 – 50 years. We anticipated including the following variables in the analysis: temperature, growing season, seasonal precipitation (both quantity and type, i.e., snow versus freezing rain), and evapotranspiration rates. We also anticipated using county-level data. Ultimately, we ended up using the gridMET gridded climate dataset ¹. This dataset consists of 4 km statistically downscaled historical temperature data from 1979-2020 at a daily timestep. Baule (GLISA) derived annual data from daily minimum and maximum temperature data (~2m above ground surface). Derived variables included: average annual daily temperature, average annual daily maximum temperature, average annual daily minimum temperature, and annual counts of threshold exceedance. Threshold exceedances calculated were: Days with maximum temperatures greater than or equal to 90F, 95F, and 100F and Days with low temperatures less than or equal to 32F, 30F, and 0F. The resulting 4 km grids were then aggregated to the mean value of each county in the contiguous United States of America. Additionally, threshold exceedance grids were aggregated to the county level, with the maximum grid cell value within each county being the value for the entire county. Outputs were provided in annual CSV files coded by state and county FIPS codes.

Hauer (FSU) built a gravity-based migration model to examine the role temperature differentials play in mediating the migration relationship. The final model uses the following variables:

Mig = the number of migrants moving between county i and county j

d = the distance between county i and county j in miles

p = the total number of migrants from county i

ΔT = the difference in annual mean temperatures between county i and county j in Celsius

$$\log \log (E(\text{Mig})) = \alpha + \beta_1(d) + \beta_2(p) + \beta_3(\Delta T) + \varepsilon$$

Hauer examined the association between temperature and migration into and out of the Great Lakes region. He found that temperature has a statistically significant association with in- and out-migration for the Great Lakes. Specifically,

- Regarding out-migration from the Great Lakes, extreme cold temperatures (days under 20 and under 0 degrees) are positively associated with out-migration while days under 32 degrees are negatively associated with out-migration. As the more northerly regions of the US warm, we could expect fewer days under 20 degrees and more days under 32 degrees. This shift in the distribution could provide a 'protective' migration effect that could be associated with more people staying in the Great Lakes region as opposed to migrating away.
- When people do move out of the Great Lakes Region, they tend to move to places that are warm, but not hot, as evidenced by the positive relationship between destination days over 90 but a negative relationship with days over 95. The common refrain that northern migrants are moving to sunbelt cities in Arizona and Florida might not necessarily be true. Rather, Great Lakes out-migrants are moving to more temperate climates rather than hotter climates.
- Migration into the Great Lakes region tends to come from areas of extreme heat (days over 100 degrees). As the US continues to warm and heat-dome-like effects are felt in a variety of regions, the Great Lakes might remain an attractive destination for those looking to escape the extreme heat. It's possible that a reverse sunbelt migration could occur, given the findings here, with the Great Lakes region poised to capture this potential northerly migration.

Originally we anticipated developing resources for climate-informed economic analysis for three distinct industries: agriculture, real estate, and tourism/hospitality. However, our project evolved to focus on individual and household migration patterns rather than economic analyses.

Outcomes and Outputs

Through this project, we created the following outputs:

- Primary GLISA small grant project outputs:
 - [Climate](#) and Demographic Change in the Great Lakes Region: a Narrative Literature Review of Opportunities and Opportunity Barriers
 - [Typologies](#) of Perspectives, Needs and Challenges of Climate In-Migration to the Great Lakes Region
 - [Temperature](#)-Related Migration and the Great Lakes Region
 - Annotated list of stakeholders interested in pursuing future work with GLISA on in-migration to the Great Lakes region
- Additional outputs co-funded by NYSERDA:
 - Climate Informed Demography [Workshop](#) and associated resources (December 2020)
 - [Climate](#) Migration Methodology Accelerator recordings
 - Climate Migration [Workshop](#): Preparing Receiving Communities and associated resources (December 2021). Workshop resources are available [here](#), and additional slides are available [here](#).
 - Peer-reviewed publication submission detailing three methodologies for addressing future climate migration in the Great Lakes region
 - [Blog](#) post summarizing combined project work

HOW OUTPUTS ARE BEING USED

- Our literature review already has several citations by other research projects
 - [The Potential Social, Environmental, and Economic Impacts on Duluth, MN as a Climate Refuge](#)
 - [PEMOCC Great Lakes Regional Workshop Writeup](#)
 - [Canada in a Changing Climate: Regional Perspectives Report Chapter 3: Ontario](#)
- New Hampshire Coastal Adaptation Workgroup and their counterparts in Maine are consulting with ASAP to design a series of convenings on in-migration to NH/ME.
- Many media outlets have connected with ASAP in 2021 to amplify the insights from this project, including:
 - [February 16](#) - Circle of Blue
 - [February 16](#) - Bridge Michigan
 - [April 16](#) - Earth Refuge Podcast
 - [June 23](#) - WDET
 - [July 7](#) - Holland Sentinel
 - [August 3](#) - ASAP Blog - Earth Refuge
 - [October 14](#) - Scientific American
 - [December 7](#) - Grist

SIGNIFICANT OUTCOMES

Built, increased, or maintained assets, such as data, infrastructure, and tools.

- This project created a new methodology for predicting future climate-induced migration based on temperature. This methodology could be used by state demographers or demographic teams in Councils of Government to refine the population projections that inform economic analyses. It could also be used by planners to inform the framing and assumptions for various types of planning efforts, including economic development plans, capital improvement plans, and comprehensive plans.

Increased the flexibility of partners by showing them new options, alternative economic approaches, or helped them obtain new funding sources.

- Through this project, insights emerged on the ability of applied researchers to predict climate in-migration. Many researchers agree that using alternative approaches, such as scenario planning, are more appropriate based on the current maturity of the science. This project helped socialize that idea and generate alternatives.

Nurtured the ability of partners to self-organize by supporting peer collaboratives or networks.

- Individuals who participated in methodology learning labs created relationships that will enable them to connect, and possibly collaborate, across disciplines in the future.

Boosted learning outcomes, resulting in a deeper understanding of science or local knowledge related to climate, impacts, and adaptation.

- The two workshops we hosted directly contributed to learning outcomes about the state of climate-informed demographic methods and the needs and perspectives of a variety of Great Lakes stakeholders and indigenous rightsholders with respect to climate in-migration.
- The 2021 workshop in particular reached a broad audience; it brought together close to 200 people across all sectors (public, private, nonprofit, and academic) to address preparing climate-receiving communities. In addition to the 200 attendees, 340 people registered and received workshop materials. The workshop covered infrastructure, labor, and housing needs in receiving communities from the perspectives of affected individuals/communities, applied researchers, and practitioners.

Shifted mindsets, resulting in documented cases of new readiness to act or acceptance of a need to act.

- By socializing the insights developed through this project, there is a greater understanding of these concepts:
- We cannot study “sending” and “receiving” communities in isolation; that the application of those terms/concepts changes based on the scale of analysis.
- We need to center justice and equity for affected people and communities in conversations, research, and action on climate migration.
- Climate migration provides an opportunity to transform into the community and region that we want to be - accessible, inclusive, welcoming, and thriving both economically and environmentally.

We received \$49,000 in additional funding from the New York State Energy Research and Development Authority (NYSERDA) to augment this project.

Challenges and Lessons Learned

Early in the project we made the decision to deviate from our original plan of creating predictions for three distinct industries (tourism/hospitality, agriculture, and real estate). We made this decision because it became clear that the science of climate migration prediction was much less mature than we had thought and because there was a large appetite for a project that focused more broadly on the movement of people. We worked with the demographers and climatologists on the project to come up with a more feasible and relevant path that would meet the interests and needs of end users. ASAP would advise future small grantees to stay flexible throughout the project and be open to adjustments and changes in scope or direction. GLISA was very accommodating and even enthusiastic about us pursuing these changes, and having that mindset from the outset would have helped us pursue those changes more readily and efficiently.

Next Steps

We are actively seeking funding and partnerships to continue this work. ASAP seeks to build on this project and continue to move climate migration discourse, research, and resource development toward activities that support developing and applying climate migration as a climate change adaptation strategy. ASAP also seeks to promote discourse, research, and resource development that looks holistically across the needs of people in leaving communities and receiving communities.

To do so, ASAP plans to work with partners to:

- Develop training and resources for practitioners across sectors. These resources will help them better frame climate migration as an adaptation strategy, better integrate climate migration considerations into existing adaptation strategies and resources, and ensure equitable and effective outcomes for both leaving communities and receiving communities.
- Convene and facilitate dialogue between researchers, practitioners, and affected individuals to bridge the gaps between research, practice and needs of sending and receiving communities. These dialogues will build stronger professional, social, and cultural connections and understanding.

References

1. Abatzoglou, J.T. (2013), Development of gridded surface meteorological data for ecological applications and modeling. *Int. J. Climatol.*, 33: 121-131. <https://doi.org/10.1002/joc.3413>