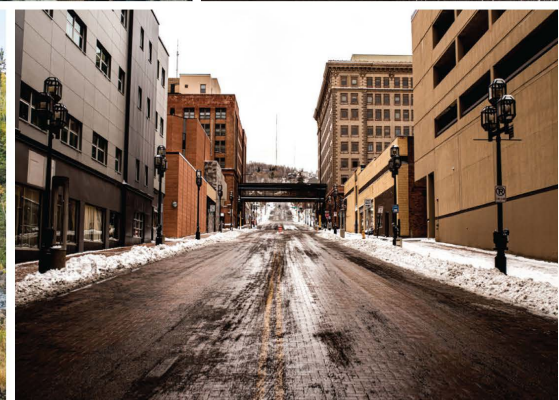
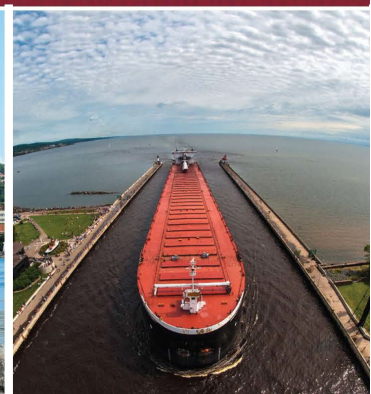
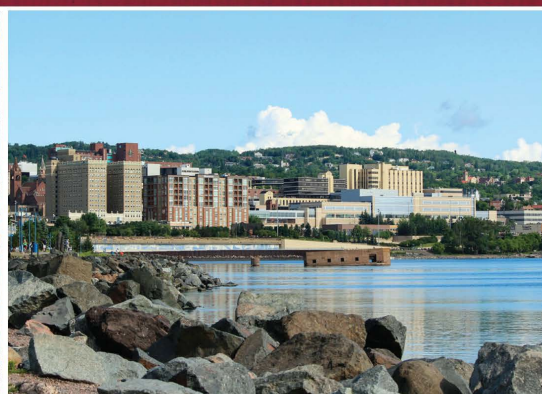


Interviews with Stakeholders:

The Potential Social, Environmental and Economic Impacts on
Duluth, Minnesota, as a Climate Refuge

May 2022



**BUREAU OF BUSINESS AND
ECONOMIC RESEARCH**

Research Team

UMD Labovitz School of Business and Economics Bureau of Business and Economic Research

Monica Haynes, Director
Kim Nichols Dauner, LSBE Health Care Management Faculty
Gina Chiodi Gensing, Editor/Writer
Ben Palmquist, Undergraduate Research Assistant
Daniel Ye, Undergraduate Research Assistant
Jacque Jones, Undergraduate Research Assistant
Bureau of Business and Economic Research
1318 Kirby Drive
Duluth, MN 55812
(218) 726-7895
bber@d.umn.edu
z.umn.edu/bber

Supported
through an
lonE Mini Grant

INSTITUTE ON THE
ENVIRONMENT



Acknowledgements

The Bureau of Business and Economic Research (BBER) at the University of Minnesota Duluth's) Labovitz School thanks the University of Minnesota Institute on the Environment for providing funding for this report. In addition, the research team thanks the subject matter experts interviewed for this study for their active participation and support throughout the project.

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

Table of Contents

Introduction	4
Existing Migration Projections and their Limitations	5
Factors Influencing Climate Migration	6
Effects of Climate Migration on Receiving Communities	7
Methods	8
Results	9
Equity.....	9
Housing.....	9
Infrastructure.....	10
Social capital	11
Community and economic diversity and development	11
Adaptability	12
Policies and other concrete action steps.....	12
Discussion.....	14
References.....	16

Table of Tables

Table 1. Interview Questions and Domains	8
Table 2. Measures to Track Impacts of Climate Migration	13

Interviews with Stakeholders: The Potential Social, Environmental, and Economic Impacts on Duluth, Minnesota, as a Climate Refuge

Abstract

In March 2019, Dr. Jesse Keenan—formerly of the Graduate School of Design at Harvard University — introduced the slogan “Duluth: The Most Climate-Proof City in America” (Keenan, 2019). He suggested that city officials should market Duluth to people relocating from climate-impacted regions, citing Duluth’s (Minnesota) cool climate, inland location, and access to fresh water as factors that make Duluth more resilient to the future impacts of climate change. Despite high levels of media attention, the literature is just beginning to address climate migration not owing to sea-level rise; the migration toward climate-friendly “destination cities” like Duluth; the perceptions of those in destination cities; and policy, social, and economic factors that could pull people toward destination cities.

Given the gaps in the literature, our research sought to examine the potential social, environmental, and economic impacts of climate migration on receiving communities like Duluth through interviews with stakeholders. In total, we interviewed 18 individuals including people from climate advocacy groups, city and state governments, tribal communities, higher education, businesses, and the energy sector, and those who were clergy, researchers and climate scientists, biologists, landscape architects, and funders. Some participants represented multiple areas.

Participants talked about existing community concerns, the most prominent being housing and racial and socioeconomic equity. The participants cited community assets as well including social capital and aspects of infrastructure related to Duluth, which once had a larger population. Also identified were potential future concerns and opportunities, suggested data to help track climate changes and impacts over time, and ways to adapt to climate change and foster resilience now and in the future.

This research points toward ways in which multiple stakeholders in an area may collaborate to plan for climate migration proactively, inclusive of multiple perspectives, and more equitably. Further, the research adds to the existing body of knowledge by providing insight from the perspective of key leaders in a receiving/destination community in the Great Lakes region, an area which is increasingly being labeled as a climate destination by persons both inside and outside of the region.

Introduction

In March 2019, the University of Minnesota Duluth hosted an event titled, “Our Climate Futures Conference,” featuring keynote speaker Dr. Jesse Keenan, formerly of the Graduate School of Design at Harvard University. At the conference, Dr. Keenan introduced the slogan “Duluth: The Most Climate-Proof City in America” (Keenan, 2019). The slogan was promoted as a way for city officials to market the city to people relocating from climate-impacted regions, and Dr. Keenan cited Duluth’s cool climate, inland location, and access to fresh water as factors that make Duluth more resilient to the future impacts of climate change. From there, media attention accelerated, due in large part to a *New York Times* feature titled “Want to Escape Global Warming? These Cities Promise Cool Relief.” The feature devoted more than 1,200 words to Dr. Keenan’s research and Duluth’s advantages as a climate refuge (*New York Times*, 2019). Today, a search for the term “climate change migration Duluth MN” returns more than 100 news articles.

Duluth was also named in a recent study by Marandi and Main (2021), which attempted to classify three

types of U.S. cities affected by climate migration: vulnerable cities, recipient cities, and climate destinations. Vulnerable cities are those likely to be most negatively impacted by the hazards of climate change and, therefore, could suffer population losses; recipient cities are those that are most likely to receive large numbers of migrants due to sudden-onset disasters; and climate destinations are cities like Duluth, which are branding themselves, or have been branded by others, as climate havens. According to the authors, climate destinations are characterized by having more manageable climate impacts, access to fresh water, an abundance of affordable housing, high infrastructural capacity, a desire to grow and be welcoming, and an interest in climate sustainability or resilience efforts.

Clearly, the concept of Duluth as a “climate-proof city” is one that has sustained the attention of the media and climate researchers. Recent population trends in Duluth and the surrounding region, however, continue to remain stable (U.S. Census Bureau). Since 2010, the city of Duluth added 432 new residents, which represented less than 1% growth. The Duluth metropolitan service area (MSA), which includes Carlton, St. Louis, and Lake Counties in Minnesota, and Douglas County, Wisconsin, added just over 1,000 residents, an increase of 0.3% from 2010. But while the region’s population has not seen dramatic increases in the past decade, the Duluth MSA saw small net positive migration during the five-year period from 2015 to 2019, according to data from the American Community Survey’s Metro-to-Metro Migration Flows dataset (U.S. Census Bureau, 2021). The Census Bureau estimates that 1,774 more residents moved to the Duluth MSA than moved away from the area during the five-year period. The region has seen the greatest numbers of new residents from Minneapolis-St. Paul, followed by non-metro counties in the U.S. Notably, a small but significant number of new residents that migrated to the Duluth MSA from 2015 to 2019 came from Los Angeles, which could represent a population that is moving to escape the impacts of drought and/or wildfire.

Beyond Marandi and Main’s article, there is limited research on the potential social, economic, and health effects of climate migration or on how regional and city planners adapt to becoming “climate destinations.” In light of this, we saw an opportunity to better understand the potential concerns, benefits, and adaptation strategies a community like Duluth should consider in preparation for increased migration. For this literature review, we are primarily interested in research related to three broad topics: migration projections and the limitations of those projections; factors that may influence migration patterns as climate change intensifies; and the potential effects, both positive and negative, of increased migration on climate destinations.

Existing Migration Projections and their Limitations

To date, much of the literature on climate-induced migration has been related to displacement from sea level rise and specifically on the effects of sea level rise on low-lying nations, such as Tuvalu and Bangladesh that have little elevation to protect them (Davis, 2018; Barnett and Mortreux, 2008; Burkett, 2011, Piguat et al, 2011). However, two recent studies have focused on migration in the U.S. context. Robinson and colleagues (2020) estimated that approximately 13.1 million people will migrate due to rising sea levels by 2100.

Historic migration trends suggest that people tend to move over short distances (Findlay, 2011; Robinson et al., 2020; Davis, 2008), and the selection of migrant destinations is to some extent shaped by pre-existing social and cultural connections, including social capital (Findlay 2011, Davis, 2008). Robinson’s and colleagues’ projections (2020) predict large increases in population in counties immediately inland from affected coastal regions and along these pre-existing networks, but the study adds to the literature by estimating the indirect effects (effects not directly related to escaping sea level rise but rather the consequence of how sea level rise will affect migration more generally) for inland communities farther into the interior of the U.S. This approach quantifies inland areas’ net incoming migration relative to their current population with lower percentage increases indicating greater adaptive capacity (Keyserling, 2018). Robinson et al. (2020) estimate that St. Louis County—where Duluth is located—will receive between 1,000 to 10,000

new net migrants through 2100 (less than 0.5% of the current population) and that each of the six counties surrounding St. Louis County and located in Minnesota and Wisconsin will receive between 100 to 1,000 new migrants (a 0.5-1% population gain) during this same time frame. This suggests that while the total number of migrants may be larger in St. Louis County, the surrounding regions may see larger increases relative to their size and may, therefore, feel greater social and economic pressures or benefits (e.g., tighter labor and housing markets, accentuated income inequality, or, alternatively, increased human and social capital). Similarly, Hauer (2017), using Internal Revenue Service's migration data, estimates a modest net migration for St. Louis County in the 1 to 50,000 persons range. The research suggests that the Midwest, being inland, will have fewer overall numbers of migrants but will experience higher levels of incoming migrants than it would have without accounting for climate impacts.

One limitation of these estimates is that they are based exclusively on sea level rise and do not account for other climate concerns like fire, disasters, or slow-onset environmental degradation (Keyserling, 2018) or the consequences of climate change, such as changing crop yields (Feng, Kreuger and Oppenheimer, 2010) or health (Haines and Patz, 2004). However, more recent studies have begun to examine the impacts of other extreme weather events such as hurricanes (McIntosh, 2008; De Silva, 2008; Gutmann and Field, 2010), wildfires (Sharygin, 2021; Cleveland Federal Reserve, 2021; Winkler, 2020), and drought (Findlay, 2011; Gutmann and Field, 2010) on migration patterns, but these studies tend to focus on specific extreme events in limited geographic areas.

Factors Influencing Climate Migration

Push and pull factors are factors that refer to a wide variety of environmental, economic, and personal motivators that either negatively push people from their place of residence or exert a pull on them to a more desirable destination (McLeman and Smit, 2006, Pigué, 2011). While there is a significant amount of research devoted to factors that attract residents to certain parts of the country, and on the effects of climate as a push/pull factor specifically, most of the literature on this topic has used traditional measures of climate (e.g., days of sunshine, coastal access, temperature) and has considered these measures to be constant.

As the impacts of climate change intensify, different climate measures that influence migration may be needed such as water quality, air quality, heat waves, flooding, or wildfires. Researchers may also need to acknowledge the rapidly changing nature of these measures. Some researchers are beginning to incorporate these elements into their research. For example, in their 2009 study on Hurricane Katrina, Gutmann and Field examined four types of environmental influence on migration, which included more traditionally positive aspects of climate (e.g., warmth, sun, proximity to water or mountains) as well as environmental calamities (e.g. floods, hurricanes), environmental hardships (e.g. drought), and environmental barriers and their management (e.g. heat, flood control). The authors suggest a gradually increasing role for all four factors in predicting migration over time. Indeed, since their research was conducted, time has borne this out. For example, a 2021 survey of 2,000 U.S. residents conducted by the online real estate company Redfin found that about half of Americans who planned to move had factored extreme weather and natural disasters into their decisions to relocate (Katz, 2021). As climate change leads to more and more extreme weather events worldwide, it seems likely that climate and the environment will become a more prominent factor in predicting migration.

In terms of climate migration, the actions of a community or government may also prove to be an increasingly important push/pull factor, as climate adaptation becomes more important to residents' quality of life (Findlay, 2011). Certainly, receiving communities have their own unique adaptation strategies, and what they say and do is likely to influence migration decisions now and in the future. McLeman (2010) argues

that in the context of climate change, “key services or infrastructure that make a community desirable can shift population change from incremental to non-linear” and that people’s perceptions and the actions of local decision makers can influence those shifts.

In the case of Duluth specifically, climate preparations have begun. In February 2022, the city released a climate action work plan to outline how it will achieve its climate goals and prepare for climate hazards. The work plan details seven strategies regarding more efficient and low-carbon energy use and transportation, storm water management, reducing public health disparities and creating sustainable opportunities for economic growth. The plan builds on Duluth’s prior work to actively engage citizens in participatory, equitable climate action and ambitious emission reduction goals. Additionally, with state and FEMA assistance, the city plans to spend \$60 million on coastal resilience and revitalization on sections of Lake Superior shoreline previously slammed by five storms, and Duluth has already invested \$140 million in upgrading its wastewater management infrastructure, avoiding the combined sewer overflow of other Great Lakes’ cities (Hemphill, 2020). Beery (2019), in a study of the construction of outdoor recreation facilities in Duluth, describes the ways in which official and civil actions are currently being implemented to deal with climate change and promote recreation opportunities (e.g. a project to provide a source of water to supplement natural ice formation while also ensuring reliable ice for climbing as naturally occurring ice is negatively impacted by the changing climate) as a way to attract investment and build environmentally protective facilities. As a whole, these steps point toward some relevant actions that receiving communities can take to prepare for climate change and that climate migrants may welcome.

Effects of Climate Migration on Receiving Communities

Regardless of what future climate migration patterns occur, it is clear that there will be significant social, economic, and health impacts on receiving communities as migration patterns respond to climate change. Keenan (2019) and Phillips (2016) both argue that there could be significant benefits to shrinking cities, such as Duluth and other rust-belt communities, to encourage climate migration. But most of the research on the potential effects of increased migration on climate destinations is, at this point, speculative.

There is, however, a solid body of research related to the economic, housing, and social impacts on communities that have experienced significant population growth due to an influx of migrants. This research can help inform today’s climate destinations and receiving communities.

For example, research suggests that destination locations should anticipate additional demand for jobs and housing, increased sales for local businesses (DeSilva, 2010), and growth in self-employment (Kourtit, 2021). At the same time, immigration can lead to segregation and hostility toward immigrants (Tabellini, 2018; Kourtit, 2021) by the locals, particularly in the case of international immigrants. When it comes to the labor market, immigration tends to negatively affect employment and wages of unskilled and low-wage workers (Yu, 2021; Kourtit, 2021). As a case in point, studies of within-country migration to Houston after Hurricane Katrina found negative effects to wages of native Houstonians (between 0.7% and 1.8%); however, which residents were most impacted is not clear (DeSilva, 2010; McIntosh 2008). The demographic and occupational characteristics of migrants have an impact on the magnitude of the effects. When it comes to housing, increased demand for housing tends to inflate costs in the short run, first in rental properties and followed by housing prices. Prices eventually fall, but not to levels seen prior to migration (Kourtit et al., Chapter 12; Saiz, 2007; Mussa et al., 2017). Housing shortages can be a limiting factor for migration and can generate inequalities and inhibit economic growth (Rodriguez-Pose, 2020).

Our research sought to examine the potential social, environmental, and economic impacts of climate migration on receiving communities like Duluth, Minnesota, through interviews with stakeholders. This study fills several gaps in the literature. We add the perspective of residents of a receiving community as they

balance issues of migration with community planning. The research also builds upon the public understanding of the local dimensions of climate change as that understanding is vital to public engagement and support for climate action (Lee, T. M., et al., 2015). Overall, data and research on receiving communities is lacking. There is a need for interdisciplinary collaboration in communities and a better understanding of future impacts of climate migration on systems such as education, healthcare, social services (American Society of Adaptation Professionals (ASAP, 2021). Our research also attempts to contribute to those areas.

Methods

The interview guide was initially developed by Dauner and reviewed by Haynes. Haynes, Palmquist, and Dauner then finalized the questions using an iterative approach. Table 1 lists the final questions and the content domains the authors were interested in learning about from the participants’ answers. Questions were modified to be more general for persons outside Duluth (e.g., When you think about people moving to escape climate change, what do you see as the most pressing concerns for host communities and why?). The study protocol was reviewed by the Institutional Review Board and the University of Minnesota and was determined to not be human research (study #00013930).

Table 1. Interview Questions and Domains

Question	Domain
When you think about people moving to Duluth/the region to escape climate change, what do you see as the most pressing concerns and why?	Social and economic concerns
What aspects of our social, economic, or cultural fabric are most resilient/adaptable to increased numbers of people?	Adaptation and resilience
What aspects of our social, economic, or cultural fabric are least resilient/adaptable to increased numbers of people?	Adaptation and resilience
What do you think the impacts of increased migration will be locally?	Impacts of migration
What needs will the community have if more people choose to live in the region?	Adaptation and resilience; impacts of migration
What will signal to you that we are handling increased numbers of people well?	Adaptation and resilience
What data do we need to help us better understand these issues? If we were to measure the impacts of climate migration, what metrics should we track?	Adaptation and resilience; data needs

SOURCE: DAUNER AND HAYNES

Participants were identified as potential interviewees if they had been quoted in popular press articles about Duluth becoming a climate destination. Additional persons were identified through their local work with regard to climate change issues. Participants were also asked at the end of the interview to identify others who could provide valuable information in an interview. If a given person was identified by two or more persons or was mentioned as having made specific climate adaptations, then they were contacted and asked if they could be interviewed.

In total, 18 individuals were interviewed. Six persons were currently located in the Twin Cities area; of these, two had recent experience living in or around Duluth; two were state employees with relevant expertise in this topic (one climatology, one demography); and two were University of Minnesota faculty studying climate

*Bureau of Business and Economic Research
Labovitz School of Business and Economics
University of Minnesota Duluth*

change and adaptation. One interviewee was from Morris, Minnesota. The remaining 12 participants were current Duluth residents. Interview participants represented climate advocacy groups, city and state governments, tribal communities, higher education, businesses, and the energy sector, and those who were clergy, researchers and climate scientists, biologists, landscape architects, and funders. Some participants represented multiple areas. Six persons (all of whom were located outside of Duluth) did not respond to our interview requests, and one person stated they did not feel qualified to respond to the questions. Each potential participant was sent the initial request and one reminder email.

Each interview lasted approximately 30 minutes. Two interviewers were present at each interview; one asked questions, and the other took notes. The notes were used for thematic-based analysis, using N-Vivo software version 12 (QSR, 2018). An initial set of codes was developed based on the domains of interest (see Table 1), with subcodes coming from inductive analysis of participants' responses. Two coders separately analyzed a subset of interviews and met to clarify the naming of codes and achieved consensus on the coding of the subset. Subsequently, they coded the remaining interviews and met once more to come to consensus on the full set of interviews.

Results

Across each theme described below, participants talked about existing community concerns and assets, potential future concerns, as well as opportunities for the future. They also described general and specific ways for the region or city to adapt to climate change and foster resilience now and in the future. Each spoke mostly from the vantage point of their employed position and for those local to, but also from the perspective of living in the city, region, and/or state. While the pretext for these interviews was the notion of Duluth being a climate destination, many participants pointed out that their climate concerns existed whether the population increased due to migration or not and that any significant increases in population would exacerbate those existing concerns.

Equity

Equity was the most mentioned theme, with 16 of the 18 participants (89%) noting it in some way. The concept of equity wove throughout all the other themes in multiple ways. As such, we provide more detail in subsequent themes as to how equity relates to those themes. Meanwhile, the following two quotes serve as illustrative examples of how equity was discussed more generally.

"When people are moving and have mobility of choice, what we will see is less opportunity for people on margins (e.g. people of color, indigenous). For many, their sense of foundation and stability is already shaky. Basic structure that's been there might crumble. We might have people falling further behind because the migrants/movers will have a leg up."

"[We] already have a community that isn't working for everyone. Unless there is great intentionality in the way we handle growth, it could make problems so much worse. We already have educational, economic, environmental, health, and housing disparities. Have to figure those issues out for the people we have before we add climate migrants/refugees."

Housing

Housing was mentioned by 15 of the 18 (83%) participants, with the biggest issue being a lack of housing. In addition to a general shortage across Duluth, particular shortage areas identified included emergency, multi-

family, and senior housing. Also of note was that the available housing does not necessarily match the demand. The fact that homes are older and are deteriorating was mentioned; with that came a concern for how deterioration drives up winter heating costs. On the other side of the same coin, it was noted that as climate changes lead to warmer summers, many housing units do not have air conditioning.

Affordable housing was also discussed and how a lack of affordable housing drives inequities that could be exacerbated as wealthier residents move in from afar (a general assumption among participants was that incoming migrants would have the means to choose to move). Displacement is a related concern, as participants talked about people already living in poverty being pushed to the margins by climate migrants. Two additional quotes illustrate these sentiments.

“The city has a housing crisis. Aging housing stock. Rents are higher than they should be for a city in [the] Midwest. Migrants are likely to be affluent and are more able to pay higher housing costs. This will increase housing costs.”

“Most pressing impact is really on housing. One’s ability to afford housing is a key component to resiliency/equity. Even though our community was built out to a larger population, the housing that exists is not affordable for many residents.”

Infrastructure

Fourteen of 18 (78%) of participants described infrastructure concerns and needs. Infrastructure included comments related to transportation, gray infrastructure (i.e. the handling of stormwater runoff), and other aspects of water management. Comments about infrastructure were mixed, with some talking about how resilient aspects of Duluth’s infrastructure are, whereas others expressed more concern for aging infrastructure and increased demand in the face of climate changes, especially in the context of potential population growth.

Transportation infrastructure was a concern. While participants described how the city and its roadways were built for more people, concerns were centered on ensuring equity via public transportation and options for greener ways to get around.

“The city was built in size for [approximately] 100,000 people. Streets and transportation infrastructure is sized for that. Also, we have sized water delivery for more people. A lot of assets that we need to keep taking care of [and] making sure they will last for storms.”

“Learning to ride public transportation in Duluth is easy, but if you want it to be your primary form of transportation, it is not convenient. And for surrounding communities, most people have to go 30 minutes in any direction to get to a grocery store. Transportation seems like a big weakness—E-bikes (cost), uphill biking, etc. all are challenges for transportation.”

Stormwater infrastructure, it was noted, is relatively robust, as it was updated after the 2012 flood. Other aspects of infrastructure are aging. As one person put it *“The base of the pyramid of needs that need to be addressed. Water, sewer, electrical, homes, roads, etc. across the board.”* Participants also had concerns that even new infrastructure could experience strain if the population were to grow significantly. Green infrastructure and water management practices, and sustained investment and commitment to renewable

energy were seen as lacking by some and as potential future opportunities by others. Some illustrative examples are:

“Duluth is home to a lot of traditional infrastructure—roads, bridges, ports. It doesn’t have a network of green infrastructure. Stormwater, measures to ensure that the water that’s flowing into the St. Louis River is all in good condition... When you look at our city, it’s so over-paved. Everything is covered in concrete and impervious surfaces. That can cause urban heat islands. And there are significant financial issues that come along with maintaining that paved infrastructure.”

“We don’t currently have operational and maintenance resources (streets, water lines, parks) in place to address significant growth.”

“Duluth has good built infrastructure and good green infrastructure. Parks, green spaces.”

Many cited attractive attributes of Duluth, attesting to the same things that led to Keenan’s remarks in 2019. Participants described the beauty of Duluth, with abundant fresh water from Lake Superior, outdoor opportunities, and lots of “green space per person” all of which has “tremendous value.”

At the same time, participants expressed a desire for Duluth to be denser if the population grows. These comments were discussed in the context of the fact that the city was built for a higher population than we presently have. So, thinking about new people coming in, the question was how we can build within the city, not expand the city out. As one person visualized it,

“Benefit could be the urban core. If we could build up the urban core with in-fill housing, people needing public transportation, our built environment, streets could handle that. Built for capacity that is greater than we have. Our most resilient element is our built environment.”

Social capital

Several participants discussed how one area of “resiliency is around social cohesion.” The sentiment that Duluth has a strong sense of community is evidenced by “extremely high voter turnout, high rates of volunteerism, high rates of financial giving to non-profits,” a “strong network of nonprofits,” and a “culture of support” among people who are “resilient” and who “lean into cultural strategies.” It was felt that these parts of our social fabric will help newcomers and current residents to adapt during climate change and be of benefit for Duluth to be a climate destination. As with other themes, there was a sense that while these things were good, we cannot lose focus on equity as Minnesota also has “a culture of racism and exclusion.”

Community and economic diversity and development

Overall, participants' comments reflected their sense that new people could have a positive effect on the community as a whole. Being a climate destination, or receiving city, brings with it the potential to be more diverse in race and ethnicity and introduces new perspectives and cultures all of which would be assets to the Duluth community. Participants also forecasted economic growth related to new residents with new ideas. At the same time, cautionary optimism was conveyed by the use of various “if” statements, which conveyed that Duluth would need to take these topics seriously and work to make them happen. These statements included “if [newcomers] want to be here,” “if we can attract diverse people,” “if there are jobs (particularly those that every town needs—teachers, doctors, service workers),” “if we can maintain our natural

environment.” One person summed up the sentiment well,

“People who are choosing this place may have more of a ‘sense of place’, more connectivity. Many are likely to bring a sense of entrepreneurship, a spirit of autonomy and independence. Currently, we are an insular and white community. An influx of new residents could be a beautiful opportunity for our community to benefit from a wider swath of humanity.”

Adaptability

This theme described stories of how particular places outside Duluth were adapting well to climate change and migration. Participants cited thoughtful and clear policies and processes for planning, transportation hubs, and broad community partnerships featuring a shared framing of issues and a shared language in these other cities. One example of insight about another community was *“they have kept the economy fairly local. Built local relationships of how they source and how their waste fits in.”*

Again equity was mentioned, with the need to adapt in ways that promote equity rather than exacerbate it. Two quotes illustrate this point well.

“ [Some] people are forced to be resilient simply because they are lower-income and more susceptible to the negative impacts from climate change. The goal instead should be that our systems are resilient.”

“Remember to bring in the voices of those who are going to be most affected.”

Learning from tribal communities was another aspect of equity mentioned when it came to being more adaptable/resilient.

“Tribes have been adapting to changes in climate since time immemorial. For them, the adaptation piece is already there. Tribal communities are at the forefront of climate adaptation. The broader community should be learning from tribes as to what they have been doing.”

It was noted that adapting equitably was not without challenges. Silos of funding and ways of working were both mentioned. *“Currently there is little expectation/support/capacity for intersectional way of thinking.”* *“Working in separate spaces.”* Also a few participants suggested coordination at a regional level “beyond Duluth,” as the impacts of climate change and any corresponding migration will be felt beyond Duluth.

Another participant summed up the need to prioritize multiple aims when adapting to climate changes and potential growth. *“At what point do we quit pitting economic development against [the] environment? Why are jobs primary? Not taking into account the environmental resiliency of our environment. We should be able to prioritize both.”*

Policies and other concrete action steps

Specific actions, including policies for actively preparing for climate change, subsequent migration, and even attracting it were described by two-thirds (n=12) of participants. The actions included those that elected leaders could make such as enhancing leadership, being more vocal, and tapping into national efforts for

financing. The fact that Duluth has a paid sustainability officer was also seen as a positive attribute.

Additional specific actions and outcomes that were mentioned by participants included “good, efficient, carbon-free transportation options that are age-friendly,” “building resilience into our [built and social] systems” and “models and data and understanding how to use [them for decision-making].”

When asked for signs that would indicate that the community was adapting well, participants responded by citing better outcomes for the above-mentioned concerns, such as housing affordability, units of multi-family housing, reduced emissions, equity measures (e.g. improvements in poverty stratified by race, school graduation rates by race and poverty status), access to treaty rights, and water management. The participants also mentioned more inclusive and equitable processes for planning as a sign of adapting well. Table 2 presents a compiled list of metrics and data sources to better observe and understand the themes detailed herein. The list is not exhaustive and many of the indicators overlap (e.g., the St. Louis County Healthy Community Index takes into account things like employment, income inequality, and voter participation, among others).

Table 2. Measures to Track Impacts of Climate Migration

Measure	Link to Report or Data
Cost-burdened households*	<u>The State of the Nation’s Housing 2020, Harvard University</u>
Graduation rates Including dropouts*	<u>National Center for Education Statistics</u>
Employment /Labor force participation*	<u>United States Census Bureau</u> <u>Economic Policy Institute</u>
Median household income*	<u>United States Census Bureau</u>
Housing affordability index	<u>National Association of Realtors Housing Affordability Index</u>
Cost of housing (monthly)	<u>United States Census Bureau</u>
Population density	<u>United States Census Bureau</u>
Voter participation/voter turnout	<u>United States Census Bureau</u>
Volunteerism	<u>United States Census Bureau</u>
Percentages of people experiencing poverty*	<u>United States Census Bureau</u>
Percentages of people experiencing homelessness	<u>National Alliance to End Homelessness</u>
Residential energy consumption	<u>United States Energy Information Administration</u>
ParkScore Index: Proximity to parks/greenspace	<u>Trust for Public Land</u>
Health Disparities	<u>CDC/ATSDR Social Vulnerability Index, St. Louis County Healthy Communities Index</u>
Hazard Mitigation Readiness	<u>St. Louis County Hazard Mitigation Plan, FEMA historical flood risk and costs</u>

* Suggested to also be considered by race/ethnicity

Discussion

Our research identified several concerns related to Duluth being a climate destination, including housing, transportation, and green and gray infrastructure demands. Interwoven across these concerns was the need for greater racial and socioeconomic equity as well as not worsening existing disparities already faced. At the same time, clean water, green space, and high levels of social capital across Duluth—as a whole, as well as within specific communities, most notably, tribal ones—may mitigate potential concerns associated with these stressors. Planning, it was noted, needs to be inclusive of multiple perspectives, equitable, and proactive, and to that end, many stories of adaptation and ideas for resilience were put forth. Being a climate destination also presented opportunities for resiliency and becoming more racially, culturally, and economically diverse.

When it comes to the effects of migration on receiving communities, our results align with prior literature in some ways but diverge in others. Local stakeholders mentioned increased pressure on housing (DeSilva, 2010). And our participants, while not specifically addressing segregation, hostility, or impacts on low wage workers (Tabellini, 2018; Yu, 2021; Kourtit, 2021), repeatedly mentioned concerns related to racial and economic equity. Findlay (2011) found that government plays a role in incentivizing or disincentivizing migration to a place. Similarly, our participants clearly saw a role for how the actions of city and regional government along with other partners could influence migration to Duluth and the experiences of those migrants. At the same time, our participants identified several concerns and benefits that have not been described well in the literature. Interviews with local stakeholders identified environmental, cultural, and infrastructure concerns. They also identified aspects of infrastructure and social capital as strengths. While prior literature has identified increased self-employment and additional demands for jobs as potential benefits to receiving communities, our participants did not explicitly mention these factors. An avenue for future research could explore these factors more quantitatively or for a broader geographic region.

The mapping of future migration patterns is typically based on previous/historic migration patterns and hasn't fully considered the idea that some parts of the country might be more attractive as climate destinations. As mentioned earlier, climate destinations are characterized by having more manageable climate impacts, access to fresh water, an abundance of affordable housing, high infrastructural capacity, a desire to grow and be welcoming, and an interest in climate sustainability or resilience efforts. While the city of Duluth might have more manageable climate impacts, access to fresh water, and an interest in climate resiliency, the results from our interviews highlight that the city has mixed infrastructural capacity and lacks affordable housing. Participants were also uncertain about the city's desire or ability to retain new residents. And while there is presently ample access to fresh water, Lake Superior and the rest of the Great Lakes are threatened by invasive species; habitat destruction; and pollutants from residential, agricultural, and industrial areas—not to mention the threats from climate change itself (NOAA, 2019). In addition, the fact that the lakes are part of an international border means that any one city cannot go it alone and must cooperate regionally and internationally to protect the water.

Respondents provided some potential metrics that communities could track in the face of future migration, and there was a clear desire to ensure that the metrics could also capture impacts by demographic groups. The suggested metrics should be considered a starting point for future evaluation efforts. The literature suggests that greater evaluative capacity is needed to systematically monitor the complexity of social, environmental, and economic phenomena associated with climate change and adaptation in the long-term (Arnott, Moser, and Goodrich; 2016). There is a need to move from identifying indicators and metrics to integrating evaluation across multiple sectors. As Duluth works on its climate mitigation and adaptation plans, a robust evaluation design should be incorporated across all sectors involved.

As the American Society of Adaptation Professionals (ASAP; 2021) points out, more climate migration

demography work is needed. The society has called for more research on receiving communities—especially impacts on education, healthcare, and social systems—and a greater focus on equity (racial, economic, and rural) and social capital. Indeed, our findings support this notion. As ASAP points out “relocations of climate migrants that follow principles of equitable adaptation and retreat can increase the success of a retreat program and build social capital, deepen civic engagement and networks, and build resilience in areas receiving climate migrants.”

This paper adds to the existing body of knowledge by providing insight from the perspective of key leaders in a receiving/destination community. The research also adds to literature on the Great Lakes region, which is increasingly being labeled as a climate destination by persons both inside and outside of the region. ASAP also called for increased interdisciplinary collaboration and new approaches to adaptation.

Next steps should include convening stakeholders in proactive planning; using the data suggested by interview participants for planning and consideration in evaluating impacts of climate change and migration. Next steps should also include more research on existing and potential policies that discourage or incentivize dense development. Also, more research is needed to better understand the capacity of local and regional infrastructure (e.g., utilities, water, sewer, transportation, and housing) from a longevity and carbon reduction standpoint. Capacity for partnering long-term will also need to be built in order to ensure that planning and policy efforts can be sustained as it is clear that the impacts of climate change are only beginning.

References

- Agency for Toxic Substances and Disease Registry. (n.d.). CDC/ATSDR Social Vulnerability Index. www.atsdr.cdc.gov/placeandhealth/svi/index.html
- Sullivan, K., & Jacobson, R. (2021, March). American Society of Adaptation Professionals. Climate and demographic change in the Great Lakes region: A narrative literature review of opportunities and opportunity barriers. <https://adaptationprofessionals.org/resources/climate-and-demographic-change-in-the-great-lakes-region-literature-review/>
- Arnott, J. C., Moser, S. C., & Goodrich, K. A. (2016). Evaluation that counts: A review of climate change adaptation indicators & metrics using lessons from effective evaluation and science-practice interaction. *Environ. Sci. Policy*, *66*, 383-392. [dx.doi.org/10.1016/j.envsci.2016.06.017](https://doi.org/10.1016/j.envsci.2016.06.017)
- Barnett, J., & Mortreux, C. (2009, February). Climate change, migration and adaptation in Funafuti, Tuvalu. *Global Environmental Change*, *19*(1), 105-112. www.sciencedirect.com/science/article/pii/S0959378008000903
- Beery, T. (2019). Exploring the role of outdoor recreation to contribute to urban climate resilience. *Sustainability*, *11*(22), 6268. doi.org/10.3390/su11226268
- Burkett, M. (2011, January). In search of refuge: Pacific islands, climate-induced migration, and the legal frontier. East-West Center. Asia Pacific Issues, 98. www.eastwestcenter.org/publications/search-refuge-pacific-islands-climate-induced-migration-and-legal-frontier
- Davis, K. F., Bhattachan, A., D'Odorico, P., & Suweis, S. (2018, June 12). A universal model for predicting human migration under climate change: Examining future sea level rise in Bangladesh. IOPscience. *Environmental Research Letter*, *13*(6). iopscience.iop.org/article/10.1088/1748-9326/aac4d4
- De Silva, D. G., McComb, R. P., Y-K., Moh, Schiller, A. R., & Vargas, A. J. (2010, May). The effect of migration on wages: Evidence from a natural experiment. *American Economic Review*, *100*(2), 321-326. www.aeaweb.org/articles?id=10.1257/aer.100.2.321
- Feng, S., Krueger, A. B., & Oppenheimer, M. (2010, June 24). Linkages among climate change, crop yields, and Mexico-US cross border migration. *Proceedings from the National Academy of Science*, *107*(32), 14257-14262. www.pnas.org/doi/pdf/10.1073/pnas.1002632107
- Findlay, A. M. (2011). Migrant destinations in an era of environmental change. *Global Environmental Change*, *21*(1), S50–S58. doi.org/10.1016/j.gloenvcha.2011.09.004
- Gutmann, M. P., & Field, V. (2010, January). Katrina in historical context: Environment and migration in the U.S. *Population and Environment*, *31*(1/3), 3–19. www.jstor.org/stable/40587571
- Haines, A., & Patz, J. A. (2004, January 7). Health effects of climate Change. *JAMA Network*. jamanetwork.com/journals/jama/fullarticle/197911
- Hauer, M. (2017, April). Migration induced by sea-level rise could reshape the US population landscape. *Nature Climate Change*, *7*, 21-325. doi.org/10.1038/nclimate3271
- Hemphill, S. (2020, April 29). Climate change comes to Duluth—One of America's “climate refuge cities.” *Ensia*, ensia.com/articles/duluth-climate-change-economy/

- Joint Center for Housing Studies of Harvard University. (2020). The state of the nation's housing 2020. www.jchs.harvard.edu/sites/default/files/reports/files/Harvard_JCHS_The_State_of_the_Nations_Housing_2020_Report_Revised_120720.pdf
- Karacsonyi, D., Taylor, A., & Bird, D. (Eds). (2021). The demography of disasters. Impacts for population and place. Springer. doi.org/10.1007/978-3-030-49920-4
- Katz, L. (2021, June 22). Nearly half of Americans who plan to move say natural disasters, extreme temperatures factored into their decision to relocate: Survey. *Redfin News*, www.redfin.com/news/climate-change-migration-survey/
- Keenan, J. M. (2019, March 20). Destination Duluth: The fact and fiction of a shared climate future. [Video]. YouTube. www.youtube.com/watch?v=vUhSckQsrwY.
- Keyserling, J. G. (2018). *Immigration control in a warming world*. Imprint Academic.
- Kourtit, K., Newbold, B., Nijkamp, P., & Partridge, M. (Eds.). (2021). *The economic geography of cross-border migration*. Springer. link.springer.com/book/10.1007/978-3-030-48291-6
- Lee, T., Markowitz, E., Howe, P., & Ko C-Y. Leiserowitz, A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, 5, 1014–1020. doi.org/10.1038/nclimate2728
- Marandi, A, & Main, K. L. (2021, August). Vulnerable city, recipient city, or climate destination? Towards a typology of domestic climate migration impacts in US cities. *Journal of Environmental Studies and Sciences*, 11, 465-480. doi.org/10.1007/s13412-021-00712-2
- McConnell, K., S. Whitaker, E. Fussell, J. DeWaard, K. Curtis, K. Price, L. St. Denis, & J. Balch. (2021). Effects of wildfire destruction on migration, consumer credit, and financial distress. Working Paper No. 21-29. Federal Reserve Bank of Cleveland. doi.org/10.26509/frbc-wp-202129
- McIntosh, M. F. (2008). Measuring the labor market impacts of Hurricane Katrina migration: Evidence from Houston, Texas. *American Economic Review*, 98(2): 54-57. www.aeaweb.org/articles?id=10.1257/aer.98.2.54
- McLeman, R., & Smit, B. (2006). Migration as an adaptation to climate change. *Climatic Change*, 76, 31–53 doi.org/10.1007/s10584-005-9000-7
- McLeman, R. (2018). Thresholds in climate migration. *Population and Environment*, 39(4), 319–38. <http://www.jstor.org/stable/45180132>
- Moore, K. K., (2022, May). Economic Policy Institute. Economic indicators: State unemployment by race and ethnicity. www.epi.org/indicators/state-unemployment-race-ethnicity/
- Mussa, A., Nwaogu, U. G. & Pozo, S. (2017, March). Immigration and housing: A spatial econometric analysis. *Journal of Housing Economics*, 35, 13-25. www.sciencedirect.com/science/article/pii/S1051137717300025
- National Alliance to End Homelessness. (2021). State of homelessness: 2021 edition. endhomelessness.org/homelessness-in-america/homelessness-statistics/state-of-homelessness-2021/

- National Association of Realtors. Housing affordability index. www.nar.realtor/research-and-statistics/housing-statistics/housing-affordability-index
- National Center for Educational Statistics. Common core of data: America's public schools. nces.ed.gov/ccd/tables/ACGR_RE_and_characteristics_2017-18.asp
- National Oceanic and Atmospheric Administration. Great Lakes ecoregion. (2019). www.noaa.gov/education/resource-collections/freshwater/great-lakes-ecoregion
- Phillips, L. (2016). Go north, young man: The great climate migration and America's shrinking cities. *Sea Grant Law and Policy Journal*, 10:2. <http://nsglc.olemiss.edu/sglpj/vol10no2/3-phillips.pdf>
- Pierre-Louis, K. (2019, April 15). Want to escape global warming? These cities promise cool relief. *The New York Times*. www.nytimes.com/2019/04/15/climate/climate-migration-duluth.html
- Piguet, E., Pecoud, A., & de Guchteneire, P. (2011). Migration and climate change: An overview. *Refugee Survey Quarterly*, 33(3), 1-23. core.ac.uk/download/pdf/20662166.pdf
- QSR International Pty Ltd. (2018). NVivo. www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home
- Robinson, C., Bistra D., & Moreno-Cruz, J. (2020, January 22). Modeling migration patterns in the USA under sea level rise. *PLOS One*, 15(1), e0227436. doi.org/10.1371/journal.pone.0227436
- Rodríguez-Pose, A., & Storper, M. (2020, February). Housing, urban growth and inequalities: The limits to deregulation and upzoning in reducing economic and spatial inequality. *Urban Studies*, 57(2), 223–48. doi.org/10.1177/0042098019859458
- Saint Louis County Minnesota. (2020). Multi-hazard mitigation plan www.stlouiscountymn.gov/Portals/0/Library/Dept/Sheriff/St.%20Louis%20County%20Multi-Hazard%20Mitigation%20Plan%202020.pdf?ver=2020-05-18-125037-697
- Saiz, A. (2007, March). Immigration and housing rents in American cities. *Journal of Urban Economics*, 61(2), 345-371. <http://dx.doi.org/10.1016/j.jue.2006.07.004>
- Siming, Y., Safdar Sial M., Shahzad Shabbir, M., Moiz, M., Wan, P., & Cherian, J. (2021). Does higher population matter for labour market? Evidence from rapid migration in Canada. *Economic Research-Ekonomska Istraživanja*, 34(1), 2337-2353. doi.org/10.1080/1331677X.2020.1863827
- Tabellini, M. (2020, January). Gifts of the immigrants, woes of the natives: Lessons from the Age of Mass Migration. *Review of Economic Studies*, 87(1), 454–486. <http://nrs.harvard.edu/urn-3:HUL.InstRepos:37326940>
- Trust for Public Land. Park score index. Top 12 U.S. cities. www.tpl.org/parkscore
- U.S. Census Bureau; 2020 decennial redistricting data (PL 94-171). Retrieved September 23, 2021, from data.census.gov/cedsci/table?q=1600000US2717000&d=DEC%20Redistricting%20Data%20%28PL%2094-171%29&tid=DECENNIALPL2020.P1
- U.S. Census Bureau. Employment status data. [census.gov/cedsci/table?q=S2301&tid=ACSST1Y2019.S2301](https://data.census.gov/cedsci/table?q=S2301&tid=ACSST1Y2019.S2301)
- U.S. Census Bureau. Median Income in the Past 12 Months in 2020 Inflation-adjusted dollars. data.census.gov/cedsci/table?q=S1903

- U.S. Census Bureau. Metro-to-Metro Migration Flows: 2015-2019 ACS. Retrieved November 3, 2021, from <https://www.census.gov/topics/population/migration/guidance/metro-to-metro-migration-flows.html>
- U.S. Census Bureau. Monthly housing costs data. [census.gov/cedsci/table?q=B25104](https://www.census.gov/cedsci/table?q=B25104)
- U.S. Census Bureau. National volunteer week: April 17-23, 2022. www.census.gov/newsroom/stories/volunteer-week.html
- U.S. Census Bureau. 2010 Census: Population and housing unit costs. www.census.gov/library/publications/2012/dec/cph-2.html
- U.S. Census Bureau. Poverty status in the past 12 months. data.census.gov/cedsci/table?q=S1701&tid=ACSST1Y2019.S1701
- U.S. Census Bureau. Voting and registration in the election of November 2020. www.census.gov/data/tables/time-series/demo/voting-and-registration/p20-585.html
- U.S. Energy Information Administration. Residential energy consumption survey (RECS) 2015 RECS Survey Data. www.eia.gov/consumption/residential/data/2015/
- Winkler, R. L., & Rouleau, M. D. (2020). Amenities or disamenities? Estimating the impacts of extreme heat and wildfire on domestic US migration. *Popul Environ* 42, 622–648. doi.org/10.1007/s11111-020-00364-4