Planning for Climate Migration in Great Lakes Legacy Cities

Derek Van Berkel

SEAS SCHOOL FOR ENVIRONMENT AND SUSTAINABILITY UNIVERSITY OF MICHIGAN

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Great Lakes Integrated Sciences and Assessments

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THE GREAT CLIMATE MIGRATION

Climate Change Will Force a New American Migration

Wildfires rage in the West. Hurricanes batter the East. Droughts and floods wreak damage throughout the nation. Life has become increasingly untenable in the hardest-hit areas, but if the people there move, where will everyone go?

by Abrahm Lustgarten, photography by Meridith Kohut, Sept. 15, 2020, 5 a.m. EDT

Duluth, Minnesota: The ‘Most Climate-Proof City’ in America?

GLOBAL SHIFTS: A CHANGING CLIMATE, A CHANGING WORLD › SPRING 2019

Destination Duluth:

Competitive Economic Development in the Age of Climigration

By **Jesse M. Keenan,** *Lecturer in Architecture, Harvard University Graduate School of Design and Center for the Environment*

When it comes to climate change and demography, much of the current discourse revolves around conceptualizations associated with refugees and internally displaced persons. These frames attempt to capture a broad range of contexts from transnational migration to post-disaster relocation. In many ways, these are arguably necessary labels to give voice to people whose identity has been disconnected from a defined sense of place, homeland and even an environment. In popular terms, these labels are often stigmatic and are oriented around the ideas of a loss of social capital, economic waste, and an alienation of belonging.

measure of elective mobility, this can be framed within a broader set of climactic and consumer-oriented amenities. Very often these consumer preferences are shaped within a broader context of global change that adds additional weights to an aging society, income inequality and social marginalization.

While there are many potential factors, it could be argued that the most reductive forms of influence may relate to whether a receiving zone—where climate migrants move to—is affordable, accessible and authentic. This paper highlights one experimental project (2018–2019) that sought to connect climate demography and economic

Jesse Keenan, a lecturer at the Harvard University Graduate School of Design

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REUTERS

World Business Markets Breakingviews Video

AMERICAS-TEST-2 APRIL 6, 2019 / 4:17 AM / UPDATED 3 YEARS AGO

Cool U.S. cities prepare as future 'havens' for climate migrants

By Sebastien Malo

NEW YORK (Thomson Reuters Foundation) - The lakefron
Duluth has some of the coldest temperatures outside Alaska
and gets more than seven feet (2 m) of snow each winter or

But Harvard professor Jesse Keenan thinks the frigid city ma
appealing relocation destination for Florida residents, as cli
increasingly unbearable heat to already warm parts of the U

"If you're Florida ... (the predictions) should be quite unnes
climate adaptation and design said in a telephone interview
Reuters Foundation.

As climate change brings more stifling summers, worse floo
rising sea level, crueler droughts and ever-longer allergy sea
consider a nice place to live may shift, along with Americans

https://www.reuters.com/article/us-usa-climatechange-migration/cool-u-s-cities-prepare-as-future-havens-for-climate-migrants-idUSKCN1RI061

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Climate migrants could come to Great Lakes region as extreme weather grows in coming years

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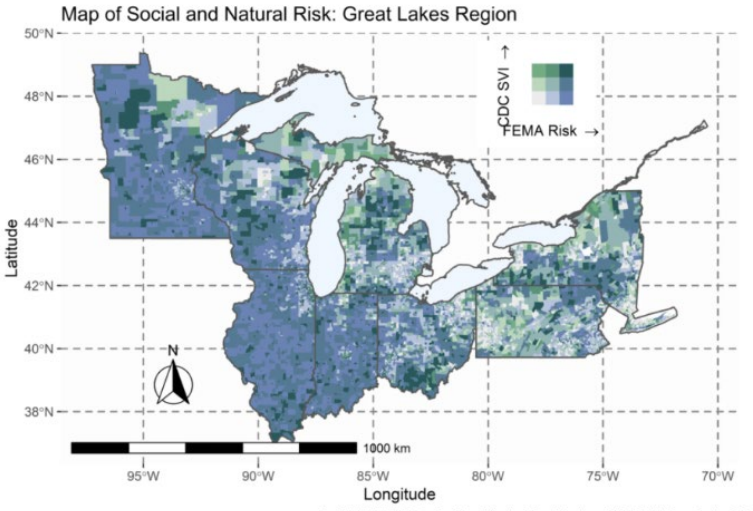
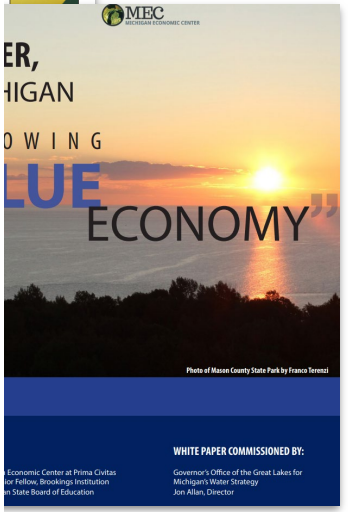


Van Berkel Et Al. / "Planning For Climate Migration In Great Lakes Legacy Cities," Earth's Future, October 2022

https://www.fastcompany.com/90645098/why-we-need-to-make-the-great-lakes-the-center-of-our-climate-strategy



Where will Climate Migrants go?

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SCIENTIFIC DATA

OPEN

Data Descriptor: Population projections for U.S. counties by age, sex, and race controlled to shared socioeconomic pathway

Received: 19 June 2018
Accepted: 12 December 2018
Published: 5 February 2019

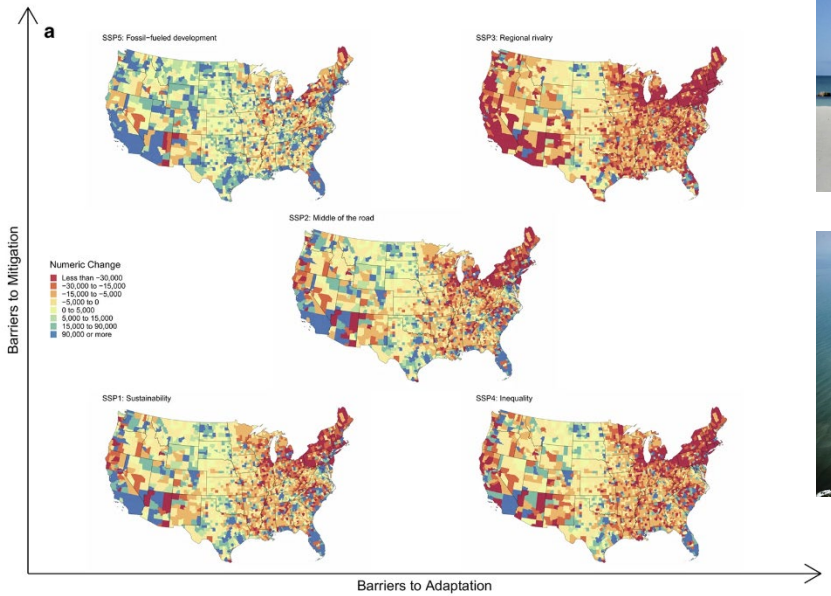
Mathew E. Hauer[1,2]

Small area and subnational population projections are important for understanding long-term demographic changes. I provide county-level population projections by age, sex, and race in five-year intervals for the period 2020–2100 for all U.S. counties. Using historic U.S. census data in temporally rectified county boundaries and race groups for the period 1990–2015, I calculate cohort-change ratios (CCRs) and cohort-change differences (CCDs) for eighteen five-year age groups (0–85+), two sex groups (Male and Female), and four race groups (White NH, Black NH, Other NH, Hispanic) for all U.S counties. I then project these CCRs/CCDs using ARIMA models as inputs into Leslie matrix population projection models and control the projections to the Shared Socioeconomic Pathways. I validate the methods using ex-post facto evaluations using data from 1969–2000 to project 2000–2015. My results are reasonably accurate for this period. These data have numerous potential uses and can serve as inputs for addressing questions involving sub-national demographic change in the United States.

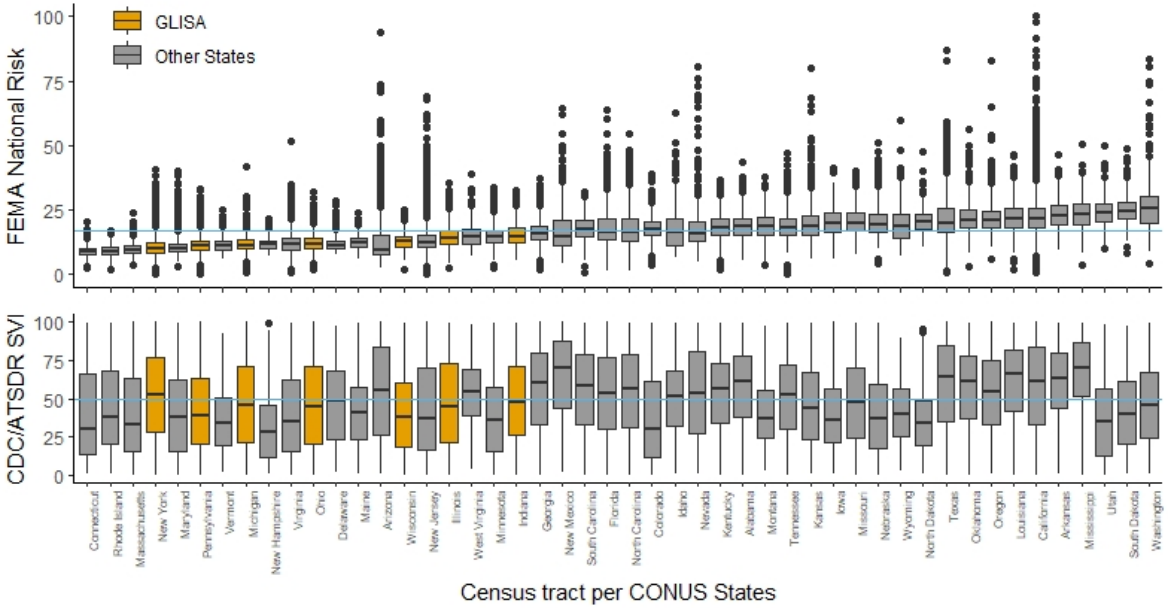
https://worldpopulationreview.com/states/michigan-population

Figure 7: Projected numeric and percentage population changes for the five SSPs between 2020 and 2100 for counties in the continental United States.

From: Population projections for U.S. counties by age, sex, and race controlled to shared socioeconomic pathway



Are the Great Lakes really attractive for Climate Migrants?



Van Berkel, Kalafatis, Gibbons, Naud, & Lemos. Planning for climate migration in Great Lake Legacy Cities. Earth's Future

Expected Annual Loss
is a *natural hazards component* that represents the average economic loss in dollars resulting from natural hazards each year.

×

Social Vulnerability
is a *consequence enhancing risk component and community risk factor* that represents the susceptibility of social groups to the adverse impacts of natural hazards.

÷

Community Resilience
is a *consequence reduction risk component and community risk factor* that represents the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.

=

NRI Risk Index
represents the potential for negative impacts resulting from natural hazards.

Overall Vulnerability		
	Socioeconomic Status	Below Poverty
		Unemployed
		Income
		No High School Diploma
	Household Composition & Disability	Aged 65 or Older
		Aged 17 or Younger
		Civilian with a Disability
		Single-Parent Households
	Minority Status & Language	Minority
		Speaks English "Less than Well"
	Housing Type & Transportation	Multi-Unit Structures
		Mobile Homes
		Crowding
		No Vehicle
		Group Quarters

Climate migration, some big question marks

- Federal policy
- Are “pull” factors enough?
  - Economic opportunities
    - Chain migration
  - Amenities
- How might cities prepare for and attract folks
  - Climate change resilience
    - Infrastructure
  - Livability e.g. greenspace
  - Appropriate housing
- How do existing residents feel?
  - Gentrification

Climate migration myths

Misleading claims about mass migration induced by climate change continue to surface in both academia and policy. This requires a new research agenda on ‘climate mobilities’ that moves beyond simplistic assumptions and more accurately advances knowledge of the nexus between human mobility and climate change.

Ingrid Boas, Carol Farbotko, Helen Adams, Harald Sterly, Simon Bush, Kees van der Geest, Hanne Wiegel, Hasan Ashraf, Andrew Baldwin, Giovanni Bettini, Suzy Blondin, Mirjam de Bruijn, David Durand-Delacre, Christiane Fröhlich, Giovanna Gioli, Lucia Guaita, Elodie Hut, Francis X. Jarawura, Machiel Lamers, Samuel Lietaer, Sarah L. Nash, Etienne Piguet, Delf Rothe, Patrick Sakdapolrak, Lothar Smith, Basundhara Tripathy Furlong, Ethemcan Turhan, Jeroen Warner, Caroline Zickgraf, Richard Black and Mike Hulme

We need to start planning now

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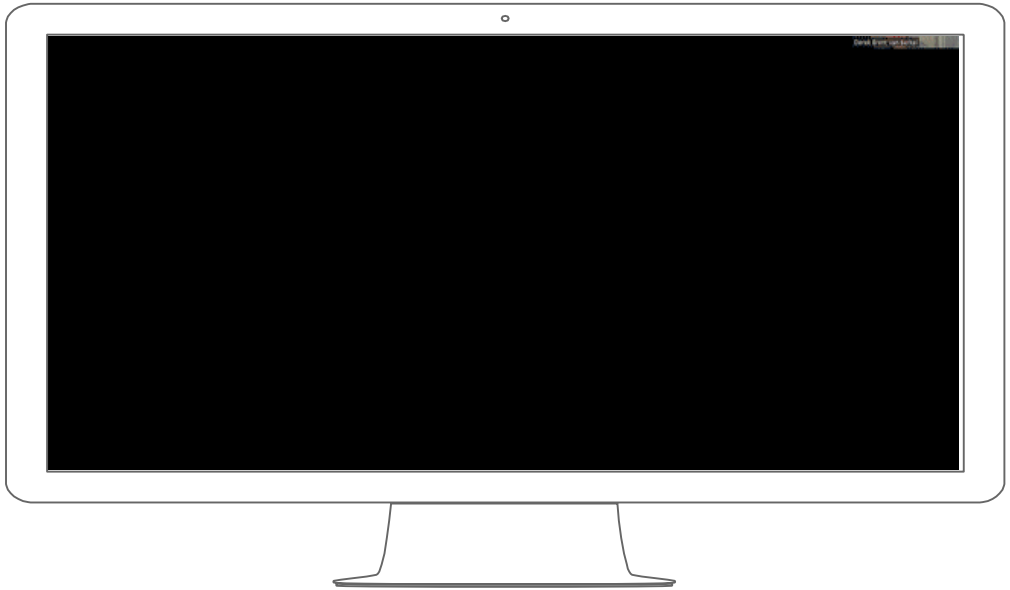
While the emergence and character of such migration is still uncertain, it is essential that GLR urban communities proactively prepare and plan for such a potential future.

Understanding how these shifts might affect residents of GLR communities will be critical for a just and sustainable future and for avoiding exacerbating existing inequalities and climate vulnerabilities.

Online tools have the potential to not only broaden participation and improve practitioners' understanding of different GLR communities' preferences, but also to anticipate emerging tensions and potential synergies associated with increased population pressures.

Participatory G**I**S urban de**V**el**O**pment **T**ool (PIVOT)

- **Development of an online tool (beta version)**
  - Current conditions
  - Urban projections
    - Climate impacts
  - Planning tool
- **Test this with Communities**
  - Workshops - planners, city practitioners, and NGOs



https://rahulab.shinyapps.io/GLISA_Urban_Development_Simulation/

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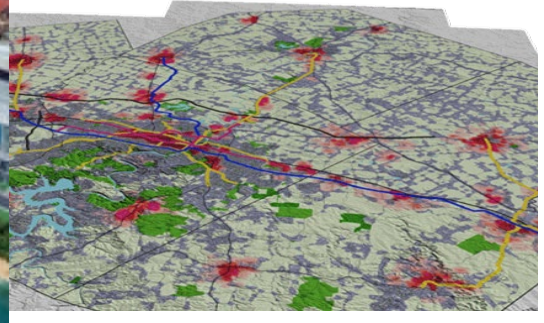
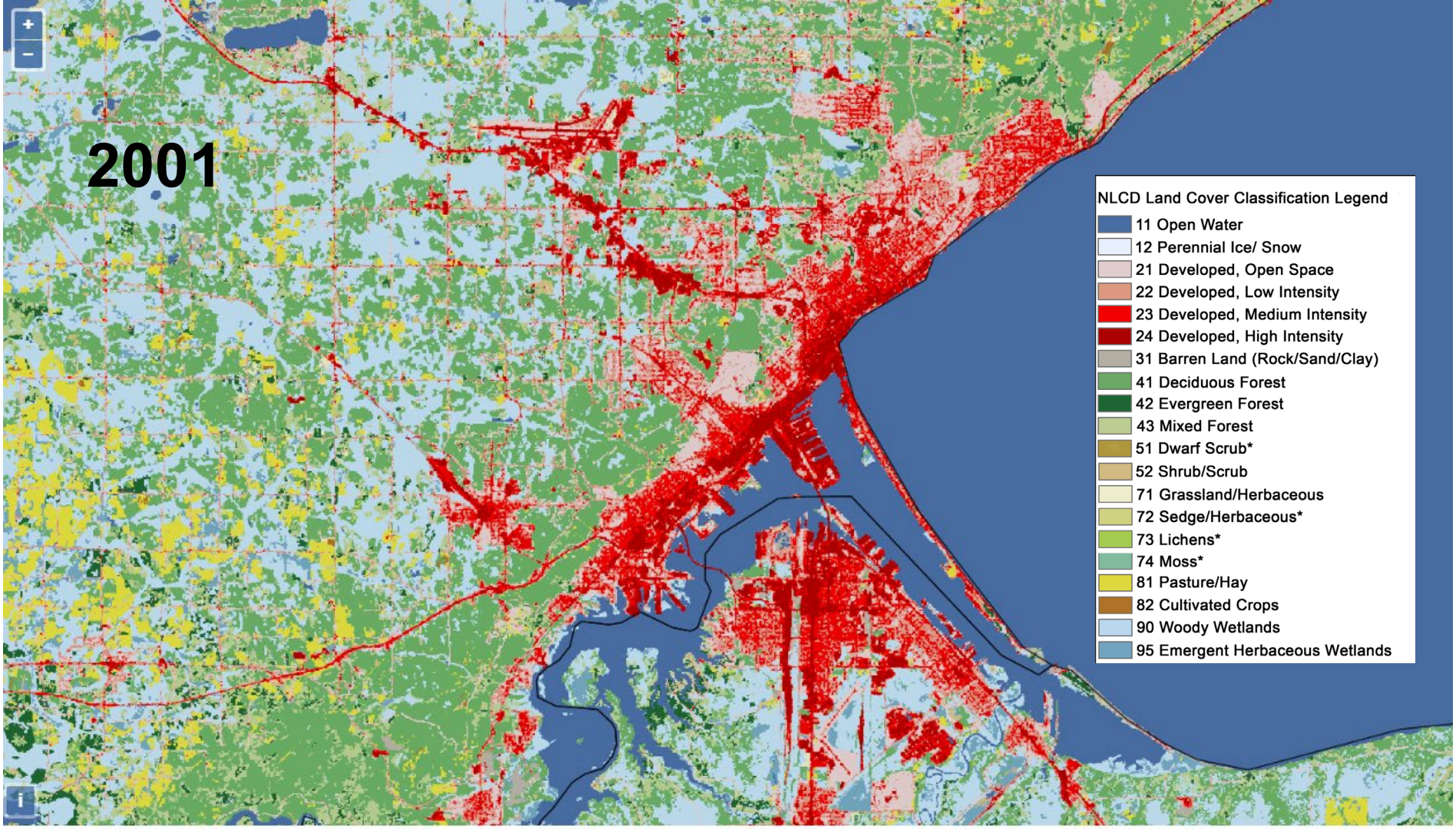
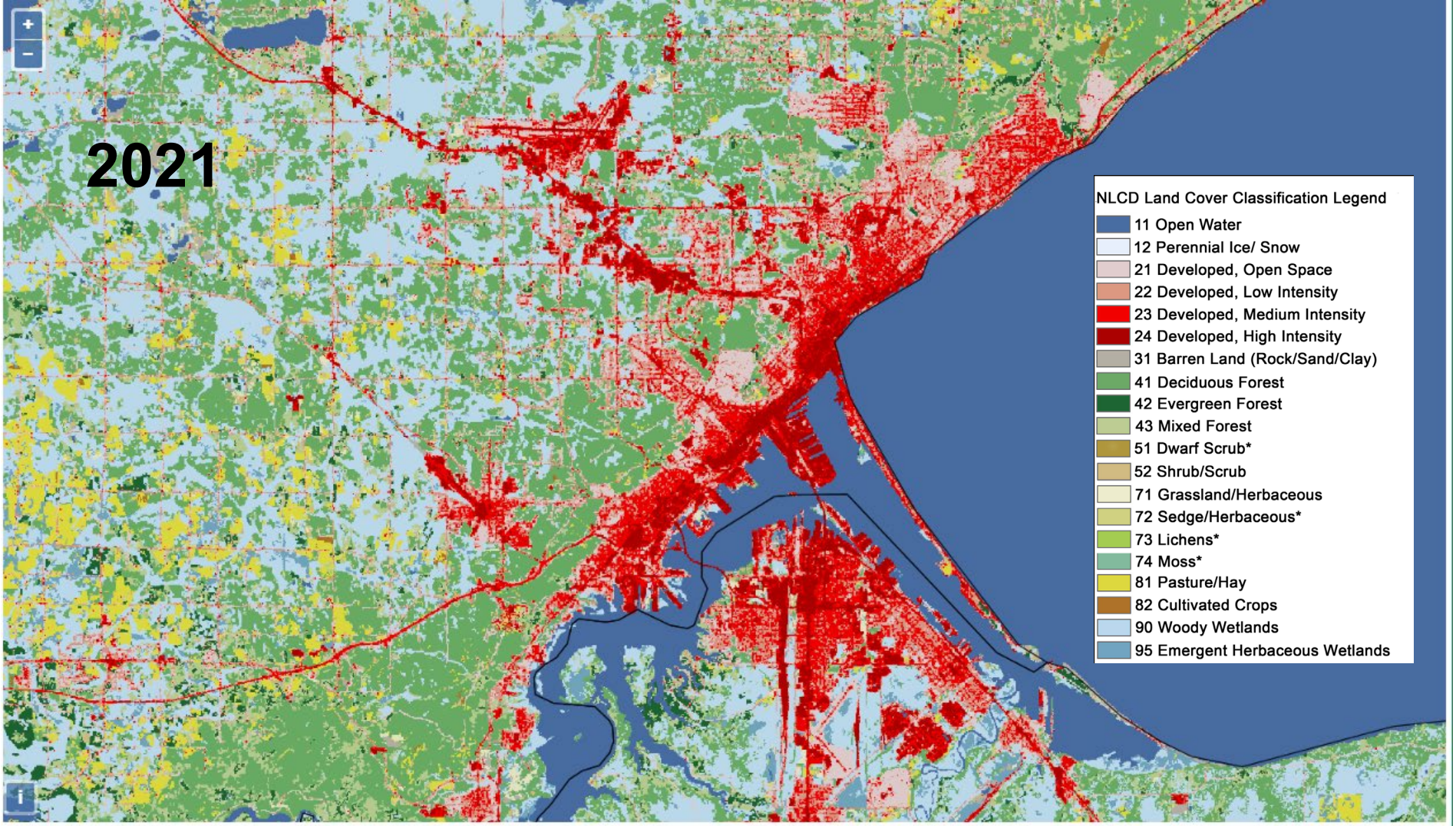
Site Suitability

- Environmental condition
- Zoning
- Transportation accessibility
- Employment opportunit
- Development feedback

tion of different development



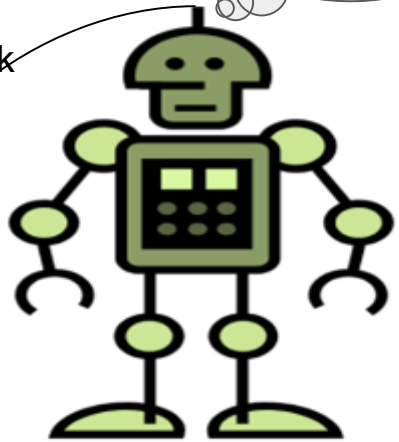

2001
NLCD Land Cover Classification Legend
11 Open Water
12 Perennial Ice/ Snow
21 Developed, Open Space
22 Developed, Low Intensity
23 Developed, Medium Intensity
24 Developed, High Intensity
31 Barren Land (Rock/Sand/Clay)
41 Deciduous Forest
42 Evergreen Forest
43 Mixed Forest
51 Dwarf Scrub*
52 Shrub/Scrub
71 Grassland/Herbaceous
72 Sedge/Herbaceous*
73 Lichens*
74 Moss*
81 Pasture/Hay
82 Cultivated Crops
90 Woody Wetlands
95 Emergent Herbaceous Wetlands


2021
NLCD Land Cover Classification Legend
11 Open Water
12 Perennial Ice/ Snow
21 Developed, Open Space
22 Developed, Low Intensity
23 Developed, Medium Intensity
24 Developed, High Intensity
31 Barren Land (Rock/Sand/Clay)
41 Deciduous Forest
42 Evergreen Forest
43 Mixed Forest
51 Dwarf Scrub*
52 Shrub/Scrub
71 Grassland/Herbaceous
72 Sedge/Herbaceous*
73 Lichens*
74 Moss*
81 Pasture/Hay
82 Cultivated Crops
90 Woody Wetlands
95 Emergent Herbaceous Wetlands

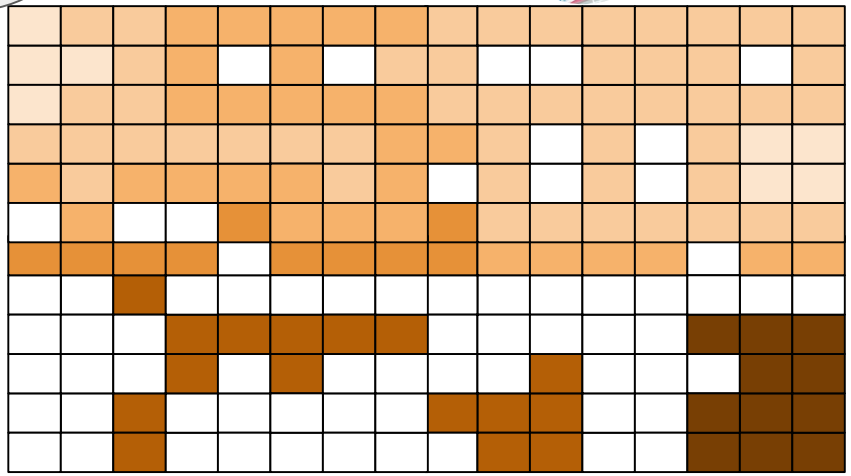
Urban Projections

Are there suitable locations for development? How many cells will we develop? How many people will live there?

5 cells, Ok



Population Demand



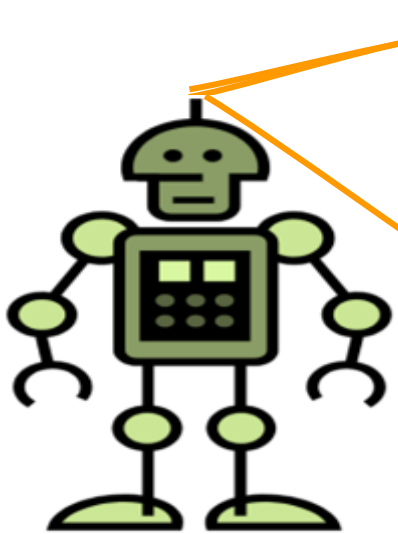
Potential urban growth

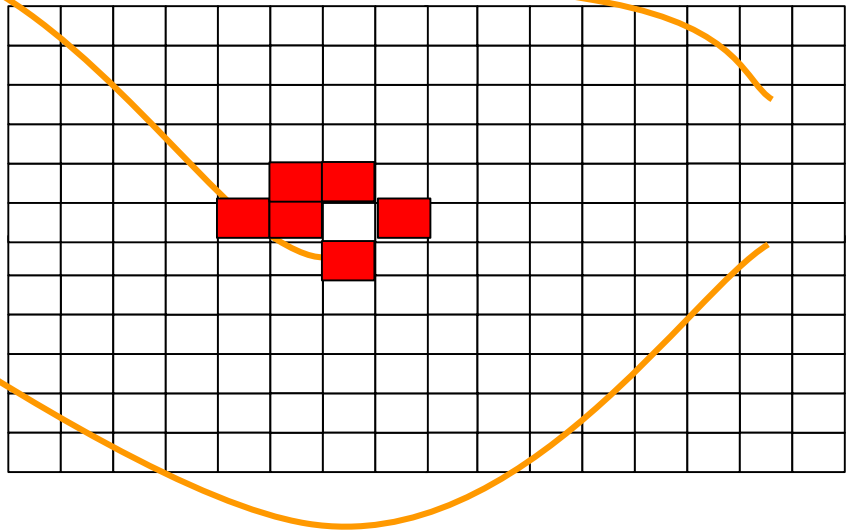
High

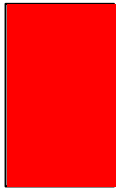
Low

Urban Projections

Site selection



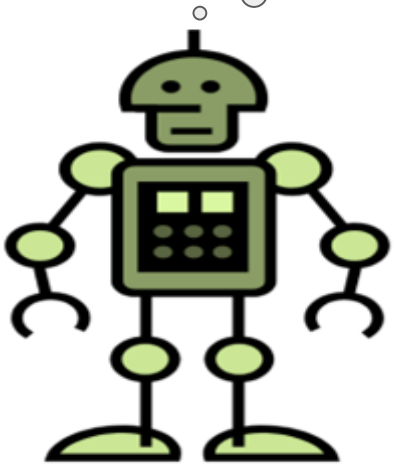


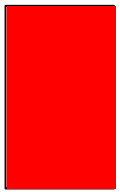


Population
Demand

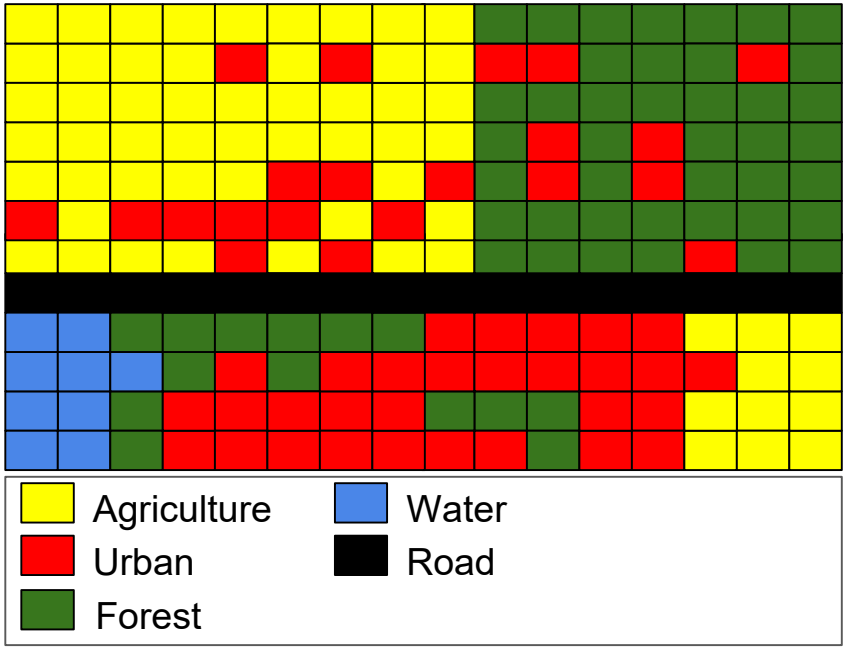
Urban Projection

We met population demand. Is there demand next year?





Population Increase



Participatory G**I**S urban de**V**el**O**pment **T**ool (PIVOT) - Urban projections

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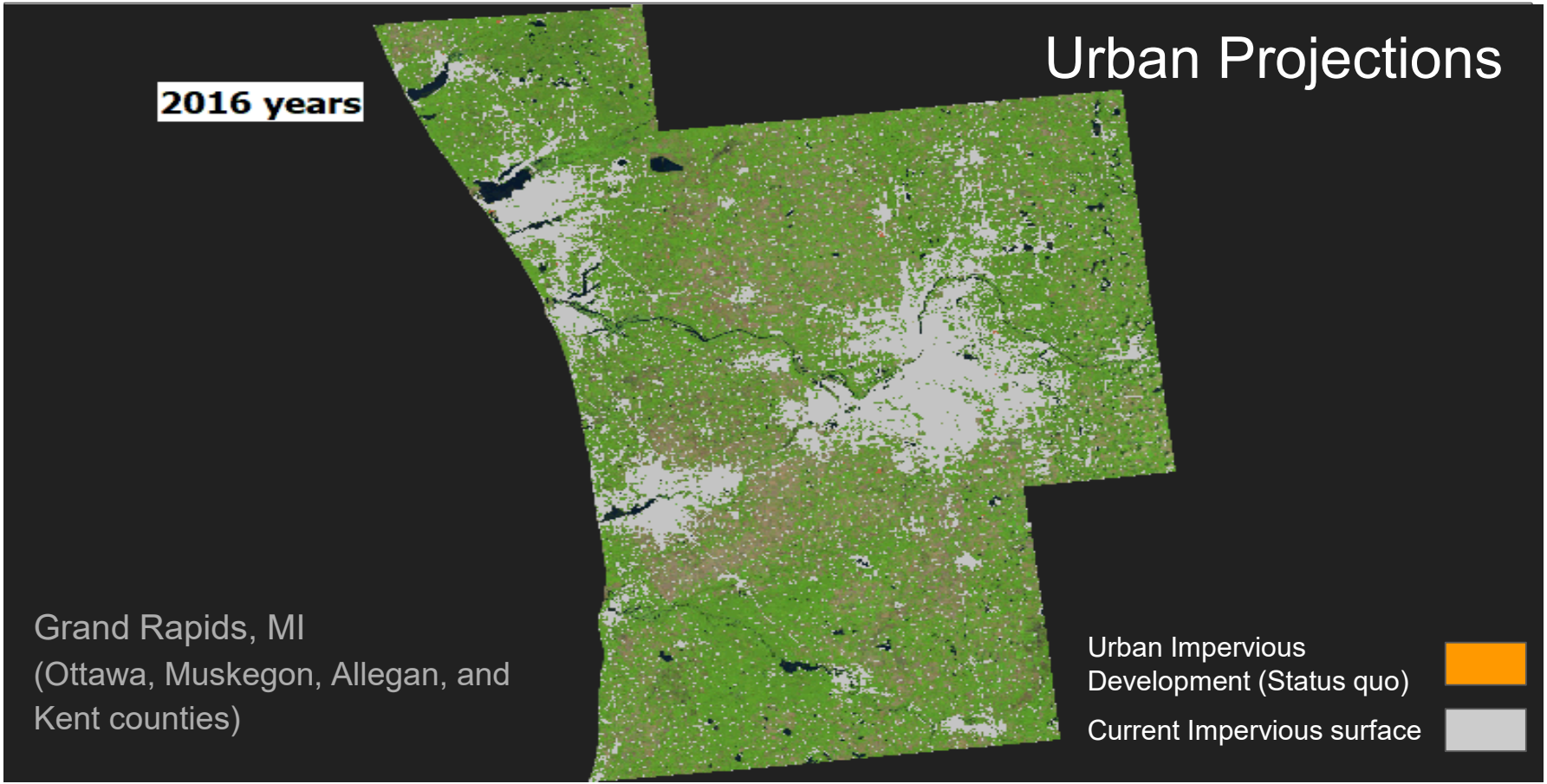
SCENARIOS of Urban change - climate migrants

If 50,000 people move into our city within the next 5 years (10,000 per year for 5 years), where is development likely to occur? With our current policies in place, can we expect increased sprawl or an infill development pattern?

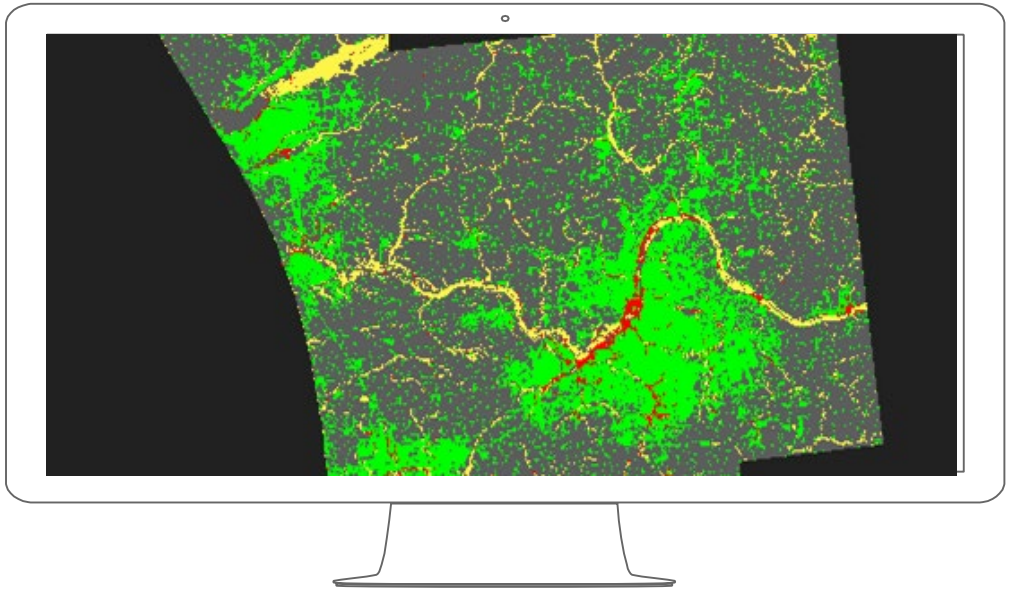
Urban Projections



Participatory G**I**S urban de**V**el**O**pment **T**ool (PIVOT) - urban projections and climate risk

SCENARIOS of Urban change - climate migrants

Will we lose our open spaces, impervious surface? Or should we take measures now to preserve our green spaces and agricultural lands?



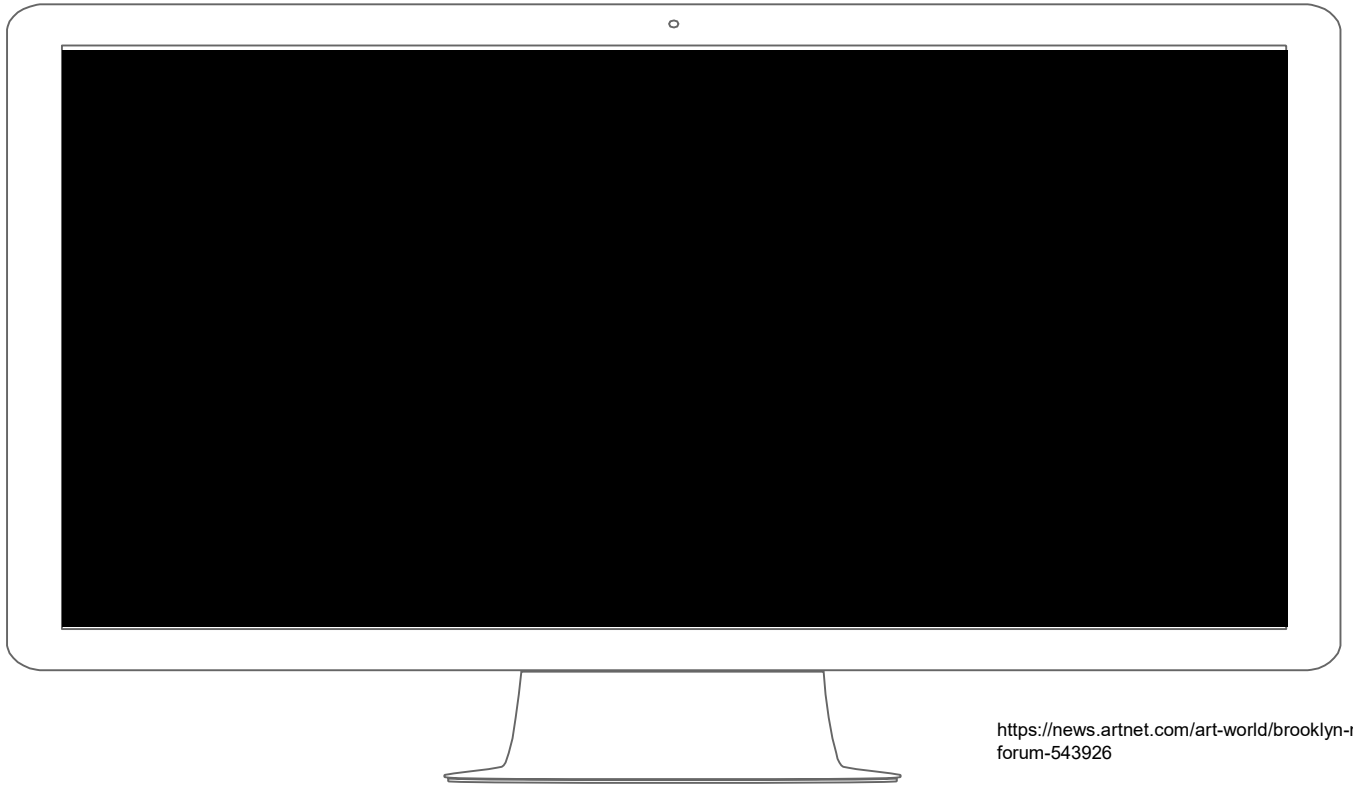
Participatory G**I**S urban de**V**el**O**pment **T**ool (PIVOT) - Planning tool

https://news.artnet.com/art-world/brooklyn-museum-gentrification-forum-543926

- **Identify and engage with cities**
  - Addressing city-specific concerns and urban model parameterization
  - Duluth, Grand Rapids
- **Ask the public**
  - Where might you want high density housing
  - Greening projects etc.
  - Public participatory GIS (PPGIS)

PPGIS spatially explicit methods for capturing and using spatial information in participatory planning processes and decision-making, and scientific inquiry

Participatory G**I**S urban de**V**el**O**pment **T**ool (PIVOT) - Planning tool



https://news.artnet.com/art-world/brooklyn-museum-gentrification-forum-543926

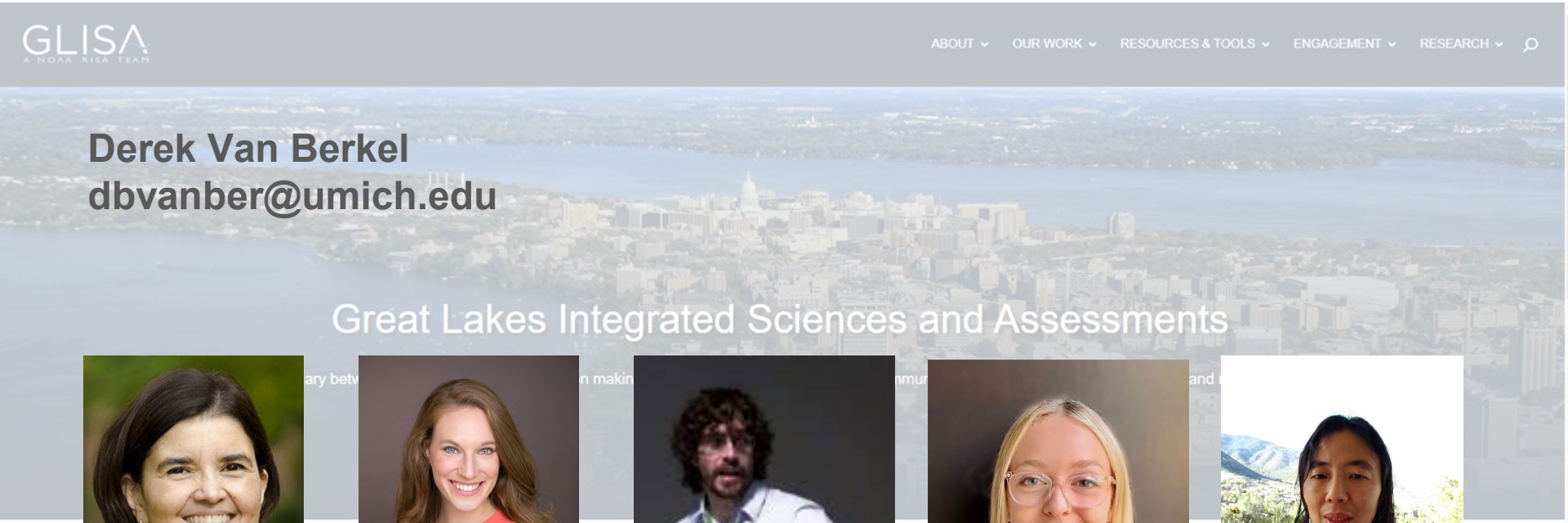
Conclusions

Through broad actionable societal engagement, cities and stakeholders might better anticipate challenges associated with increased population pressures and chart preference for growth.

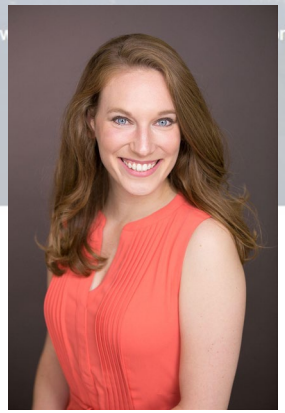
New digital tools that bring this information to stakeholders in interesting ways such as online geospatial land change models (LCM) that describe, explain, and project complex spatiotemporal dynamics of urban change may structure these discussions and add to community learning through interactive scenario development.

This might allow different stakeholders to voice their community preferences for development and provide a platform for co-creating scenarios of change that can inform decision-making and provide plausible visions for the future we as a society want.

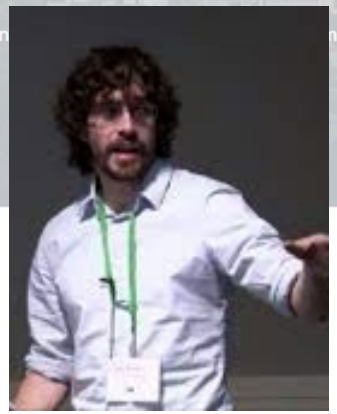
Questions



Maria Carmen Lemos

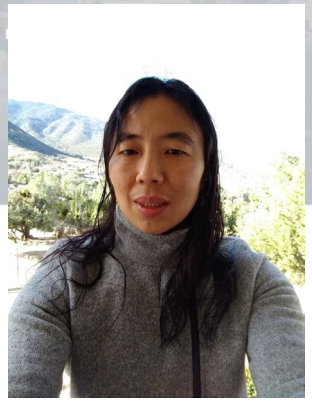


Devin Gill



Scott Kalafatis

Lisa Maillard



Erica A Goto

Questions

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