



Building the Future

*How 3D Printing is Creative
Placemaking and Revolutionizing
Construction & Workforce Development*

ONE OVERALL TREND

PANDEMIC MIGRATION

The Great Pandemic Migration

Census data reveal huge shifts out of the most locked-down states.

escape the coronavirus

ion of 2020: On the move to

The Next Affordable City Is Already Too Expensive

IF IT,

In Spokane, Wash., home prices jumped 60 percent in the past two years. The increase is fueled by buyers fleeing the boom in cities like Austin. Who will have to flee next?


THE R WHY I'

Janu

Economy

Rents millic

Rising rents are expected to be a continuing problem in 2021, and have been an ongoing policy challenge for the Biden administration.

 Listen to article 9 min

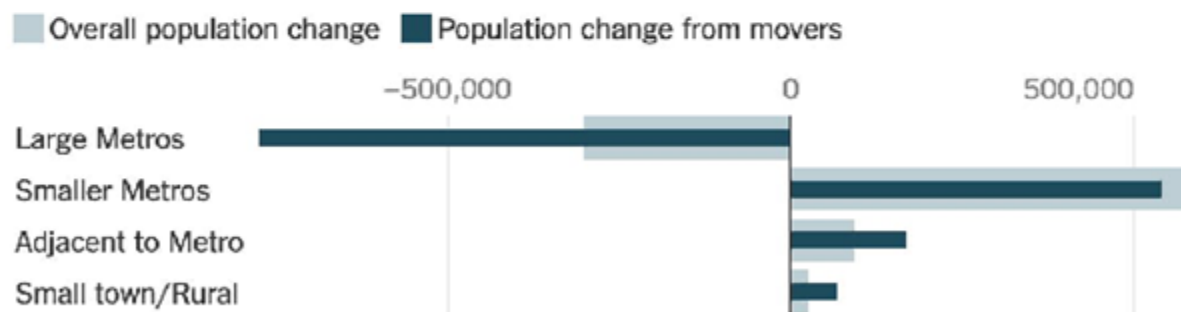
The 10 best places to move to in the UK for hybrid working

Rural working hubs — where you can get quiet, coffee and even climbing walls — are on the rise

is city planners to ign

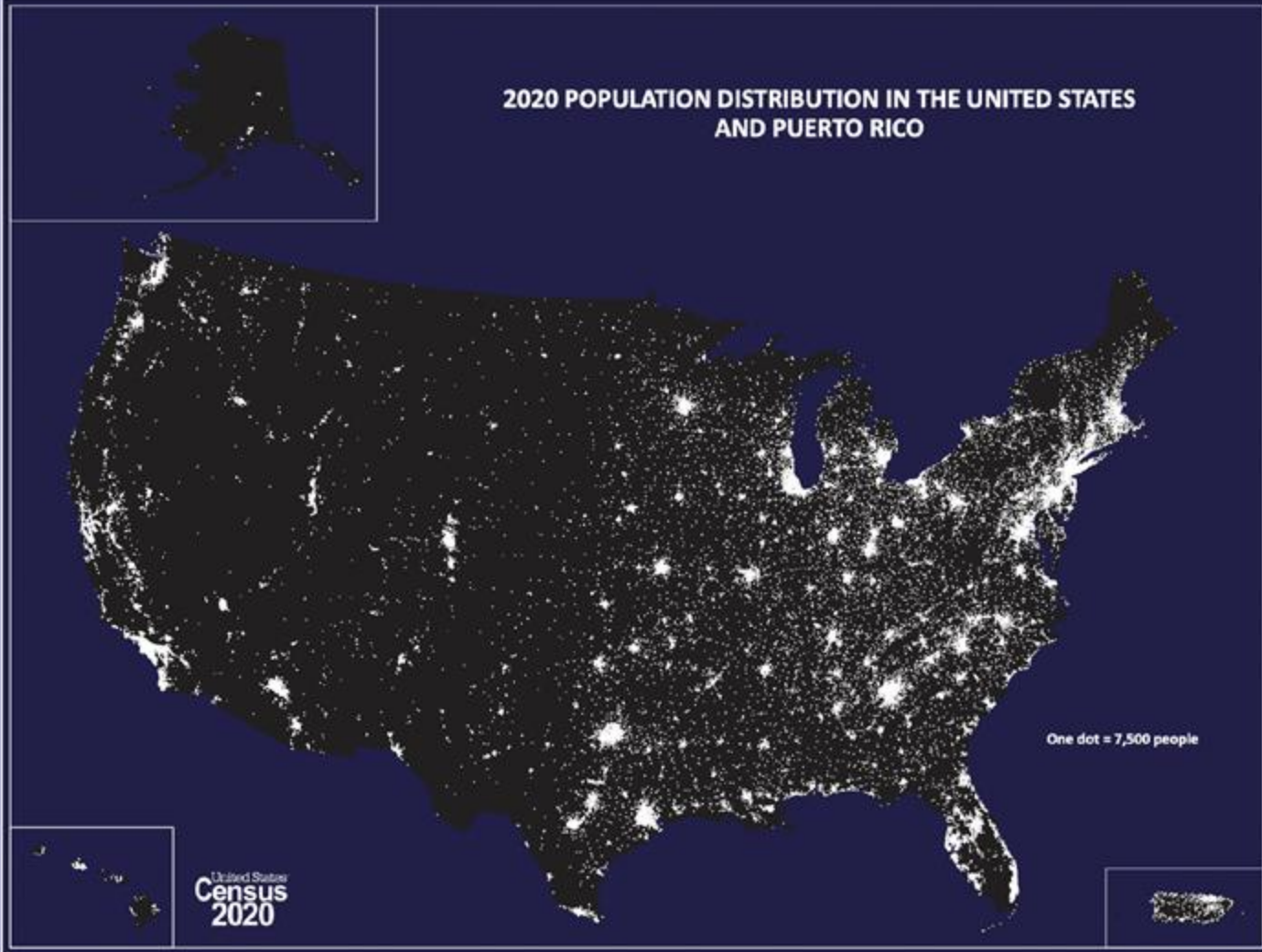
'The pandemic played a role, as the number of people dying rose substantially and many Americans left cities for smaller places. But experts say that **skyrocketing housing costs were also to blame, and that some of the changes are a continuation of fundamental shifts in American demographics that began before the pandemic...**'

Estimated population change from 2020 to 2021



Source: U.S. Census Bureau • By The New York Times

2020 POPULATION DISTRIBUTION IN THE UNITED STATES
AND PUERTO RICO

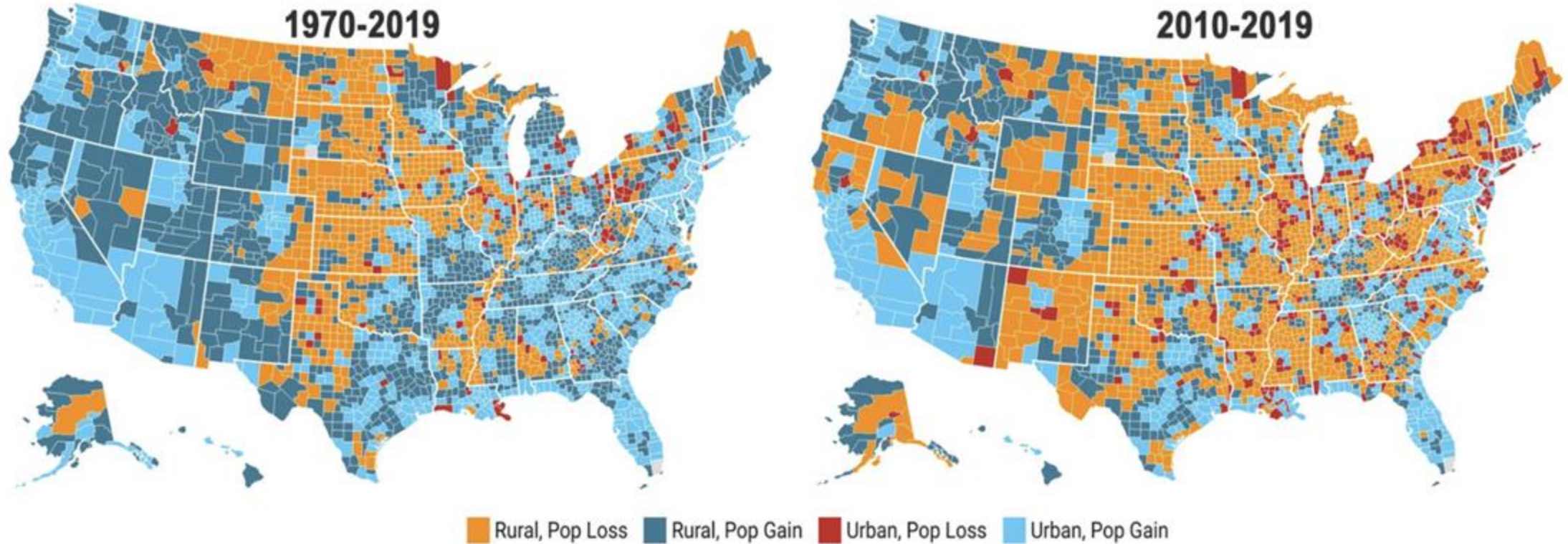


One dot = 7,500 people

**For the past 50
years the coasts
of America have
been
oversaturated**

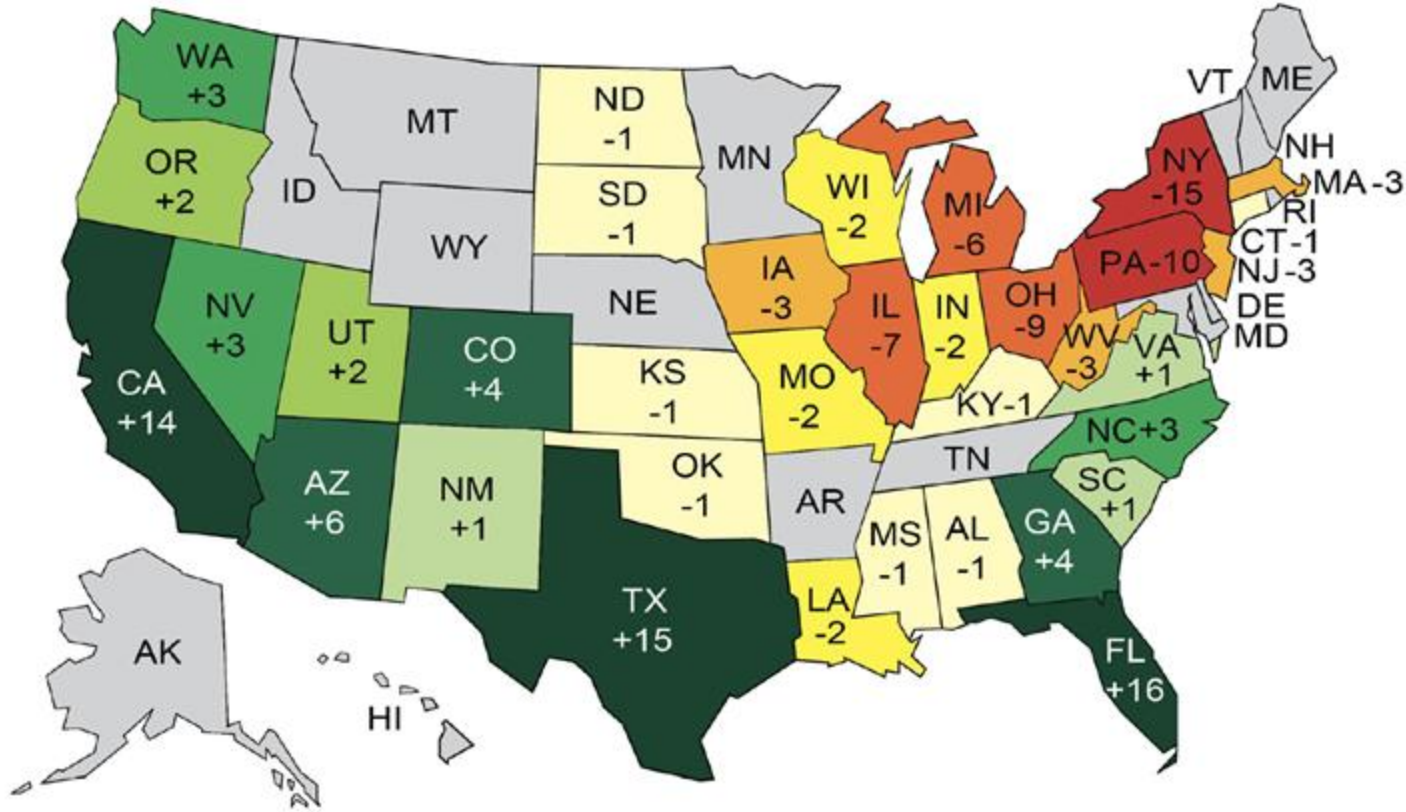
POPULATION CHANGE

50 YEARS VS. 10 YEARS



Two-Thirds of all rural counties lost population between 2010 and 2019

©2021 UVA Center for Politics



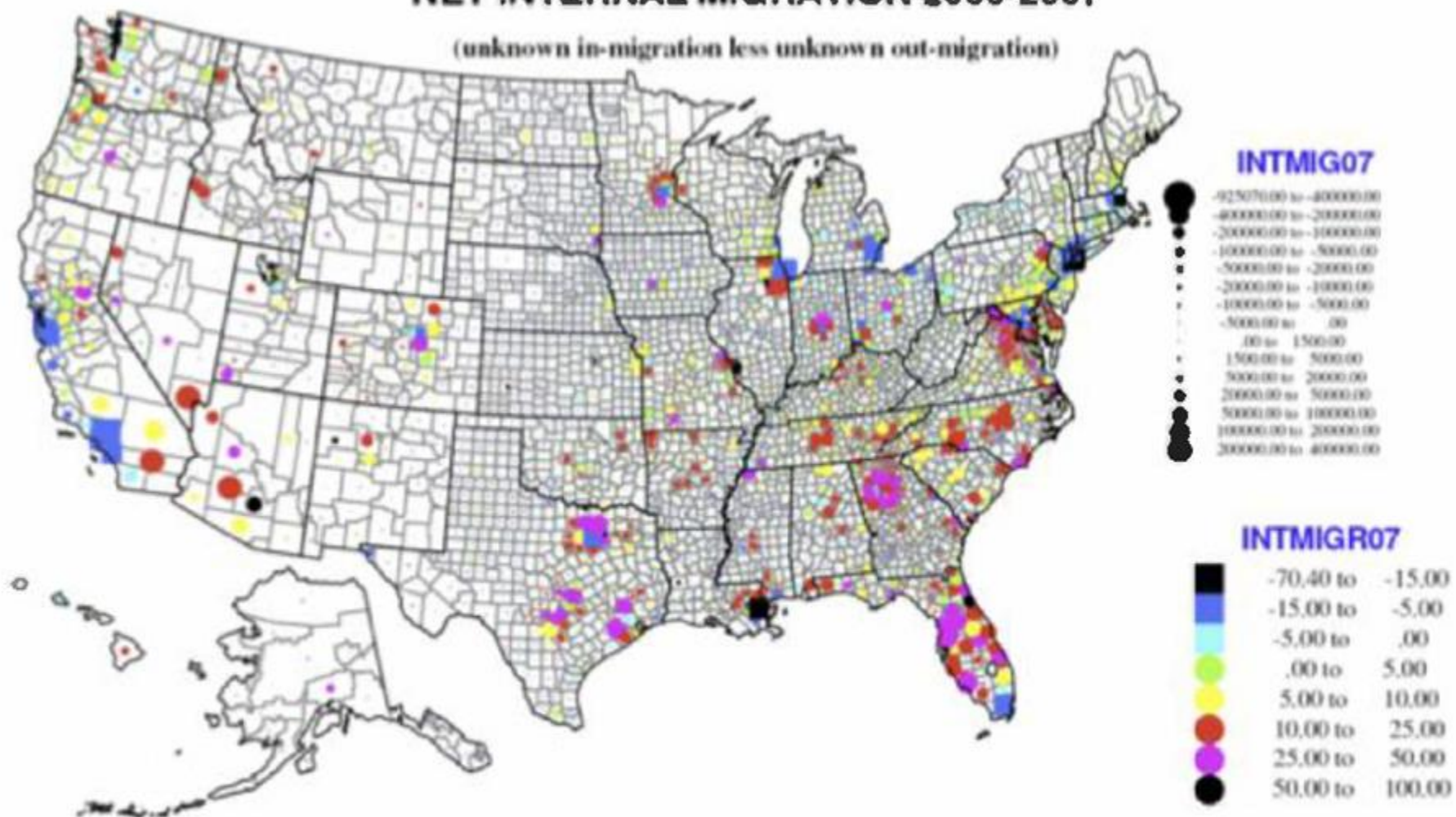
NET CHANGES IN CONGRESSIONAL SEATS

1960- PRESENT



NET INTERNAL MIGRATION 2000-2007

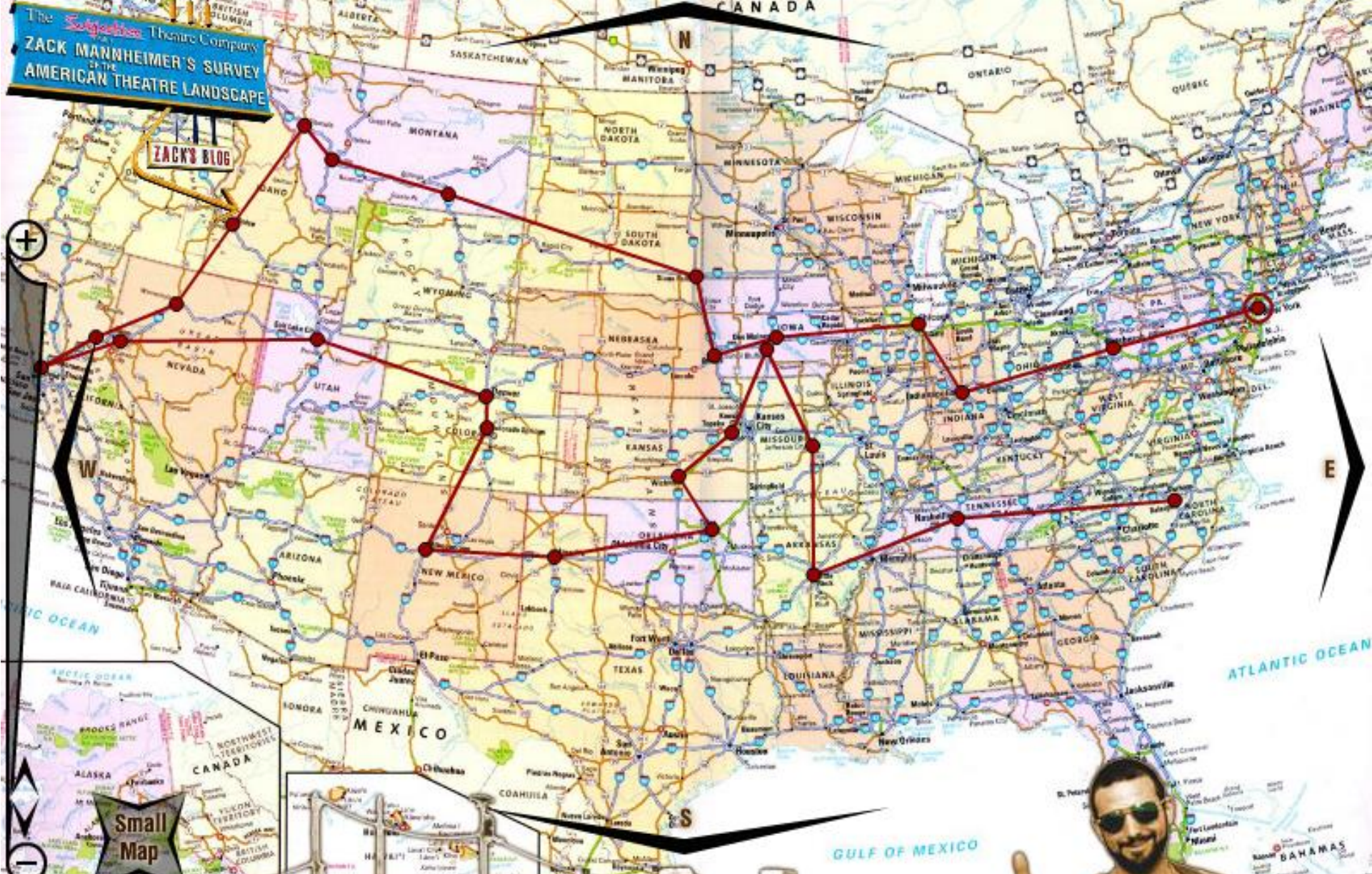
(unknown in-migration less unknown out-migration)





The *Subject* Theatre Company
ZACK MANNHEIMER'S SURVEY
OF THE
AMERICAN THEATRE LANDSCAPE

ZACK'S BLOG



Small Map



DES MOINES SOCIAL CLUB

You Are A Member

**Working with local
artists to create and
present their work**

**Working with local
businesses on the
retention and
recruitment of young
people to central
Iowa**

**Building
community
through the arts**

DMSC Annual Numbers

- Annual Budget: \$1,400,000
- Earned Revenue: \$770,000
- Reach 250,000+ audiences
- Produce 500+ events in all art disciplines
- Work with 1,000+ local artists
- Education program 1,000+ students
- Work with 50+ businesses
- Full/Part Time Staff: 9
- Contract Staff: 250+
- Paid Interns: 12
- At least 2 different events every night that reach as opposite audiences as possible



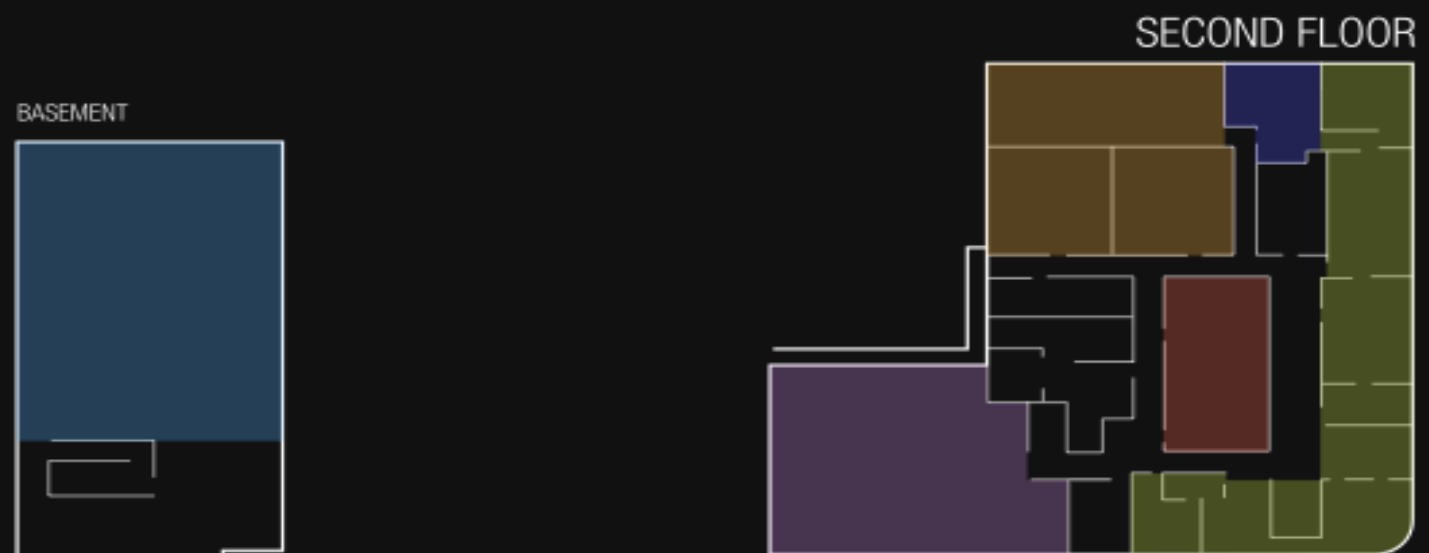
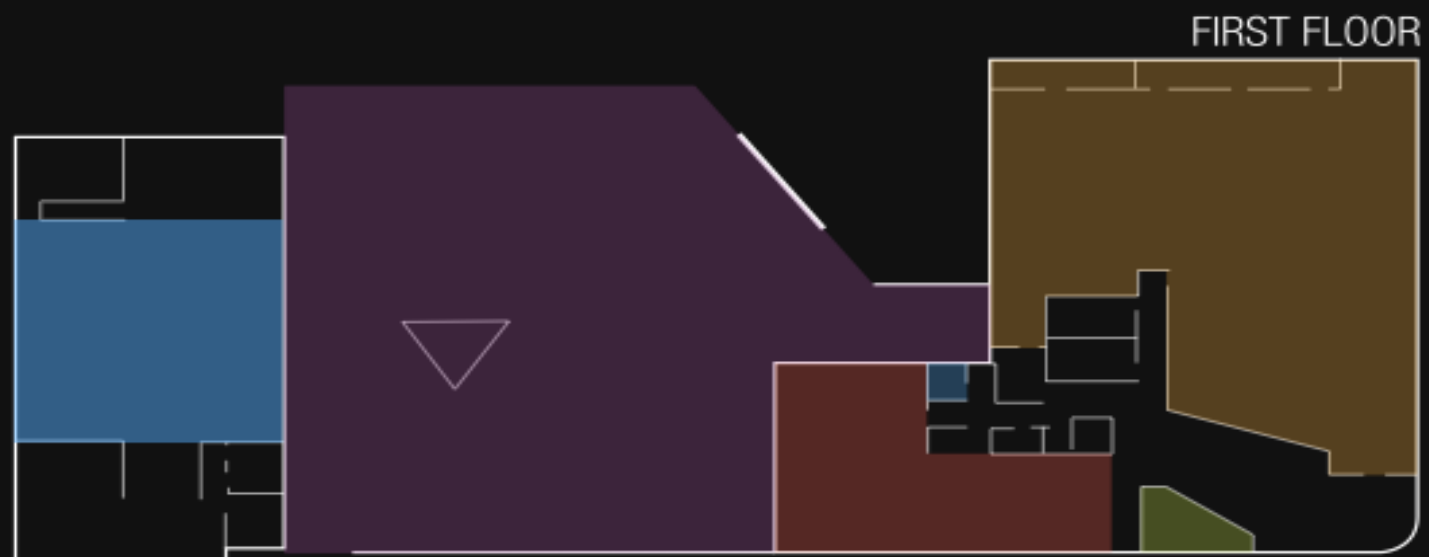








SPACES



BASEMENT



























HEADQUARTERS
DES MOINES SOCIAL CLUB





3-HEADED MIGRATION MONSTER

- **Climate-based migration**
- **Pandemic migration**
- **Economic migration**

**RIGHT
NOW**



**1 - 2
YEARS**



**2 - 5
YEARS**

SECOND CITIES

Kansas City, MO
Minneapolis, MN
Denver, CO
Austin, TX
Nashville, TN
Portland, OR
Charlotte, NC
New Orleans, LA

THIRD CITIES

Richmond, VA
Des Moines, IA
Tulsa, OK
Memphis, TN
Little Rock, AR
Birmingham, AL
Bend, OR
Boise, ID

FOURTH - SIXTH CITIES

Greeley, CO
Savannah, GA
Traverse City, MI
Paducah, KY
Butte, MT
Bentonville, AR
John Day, OR
Clarksdale, MS

NEXT 5 YEARS

3-HEADED MIGRATION

For the first time in the post industrial world – you don't have to be in the center of a City to experience all that the world has to offer

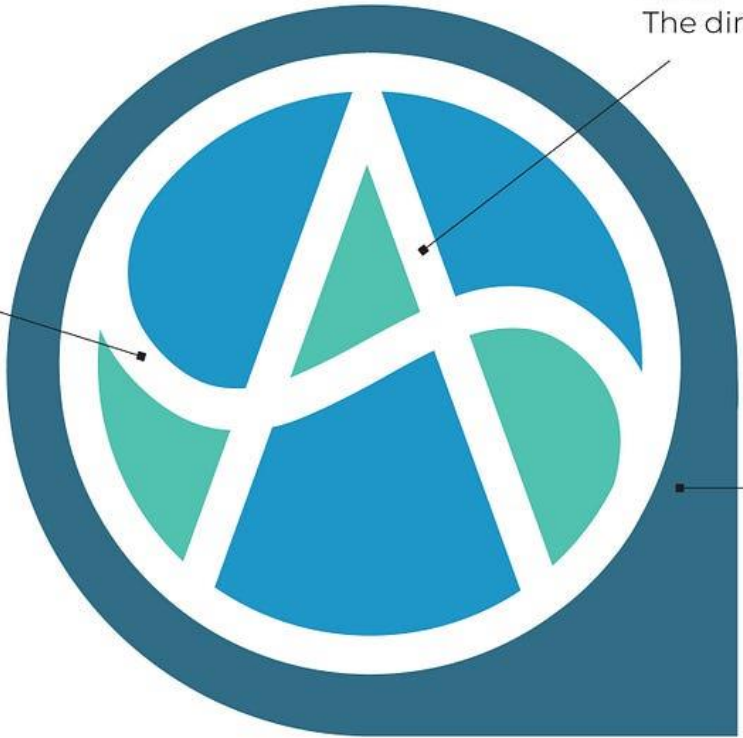


- Business Opportunities
- Arts & Culture
- Education



ATLAS
community
studios

Studio
Where the magic happens



Atlas
The direction, guide

Community
The people, conversation



Atmore, AL (pop. 8,330)



COMMUNITY VISIONING

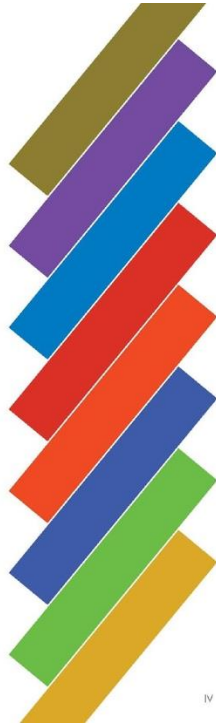
Residents' ideas are essential to any community planning effort. After all, they know the community best. Through three visioning sessions, residents shared their hopes and dreams for their community. They contemplated what is missing in Greene County, what is needed to support workforce development, and

what would make Greene County a vibrant destination.

Several themes emerged from these three sessions, including:

- » An indoor/outdoor sports complex
- » An indoor pool
- » An aquatic center
- » A business class restaurant
- » A brewery
- » Walkable downtown that promotes retail
- » Trail connections
- » School board referendum

Residents believe there is the opportunity to expand live music offerings, youth activities, and connections between parks, trails, and rivers. They also noted there are updates needed to school infrastructure and housing.



ACTION PLAN

Based on community feedback and quantitative research, eight catalytic initiatives have emerged to transform Greene County. Specific engineering, funding, and marketing efforts will be essential in moving these projects forward. These eight efforts are detailed on the following pages.



COMPONENTS OF THE 3-BLOCK PROJECT

GREENE COUNTY EARLY LEARNING CENTER

The center, operating out of a former grade school, needs to not only grow in space, but also remodel it's rooms. Initially, the non-profit was looking at building new at a different location. However, cost, and the ability to be a part of a major project on the 3 blocks has moved the board's thinking toward one of the following options: stay and expand the current facilities, or build a new facility directly next to the current facility and tear down the existing facility for use as parking. The renovation would include a new, state-of-the-art playground center just behind the building to the north. A just completed study done by the Day Care estimates the project cost at \$2,300,000.

SPLASH PARK AND PLAYGROUND

Sitting adjacent to the playground, the community has envisioned a splash park with zero-entry pools for children to utilize in the warmer months. This space would be open to the public and include daytime activity for the children in the day care.

MIDDLE SCHOOL BUILDING RESIDENTIAL RENTAL UNITS / CONDOS

This will largely be a private sector deal. A developer needs to be identified to take on ownership of the building. It is anticipated that the gymnasium building will likely come down to make room for more green space. Community should plan on an incentive package of about \$500,000.

HARRISON STREET CLOSURE

In order to make the entire 3 block radius fully walkable and safe, it is recommended that Harrison Street, between Elm and Vine Streets, be vacated from vehicular to pedestrian. This will allow for further green space to be included in the overall plan. City of Jefferson will be responsible for street closure.

POTENTIAL FUNDING OPPORTUNITIES:

Iowa Funding

- » Enhance Iowa

Federal Funding

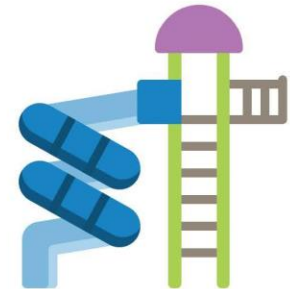
- » USDA Matching Grant
- » Economic Dev. Authority Grant

National Foundations

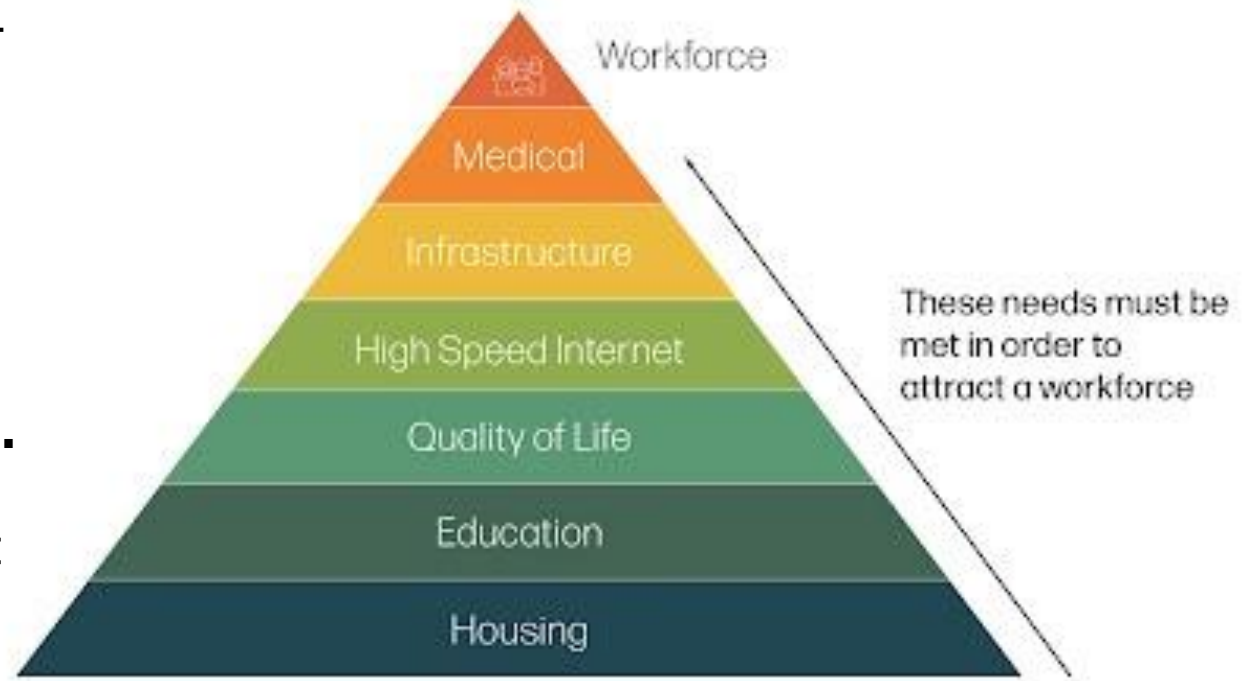
- » Kresge Foundation
- » Ford Foundation
- » Knight Foundation
- » US Bank Foundation
- » Wells Fargo Foundation
- » Pew Foundation
- » Discover Card Foundation
- » Chan Zuckerberg Communities Thrive Initiative

INDOOR AQUATIC PARK

The indoor element of the aquatic park will be attached to the current community center and, ideally, operated by the City. This space will need to have a diverse concession stand in order to help offset much of the operational costs to the City. Estimated cost: \$2,000,000.



Rural America, micropolitan, and under-served urban communities will drive innovation in the next few decades. **As more Americans shift where they live and work due to climate, financial, and pandemic migration, overlooked communities will see a rise in creatives and entrepreneurs.** This means we need the housing, infrastructure, and amenities to support them.



COMMUNITY HIERARCHY OF NEEDS

PROBLEM

**FOR EVERY \$1,000
INCREASE TO THE PRICE
OF A HOME, 153,967
FAMILIES ARE PRICED
OUT.**

National Association of Home Builders March 2021

PROBLEM

Wealth generation in the U.S. is based upon home ownership. If we can't afford a home, the American Dream isn't real.



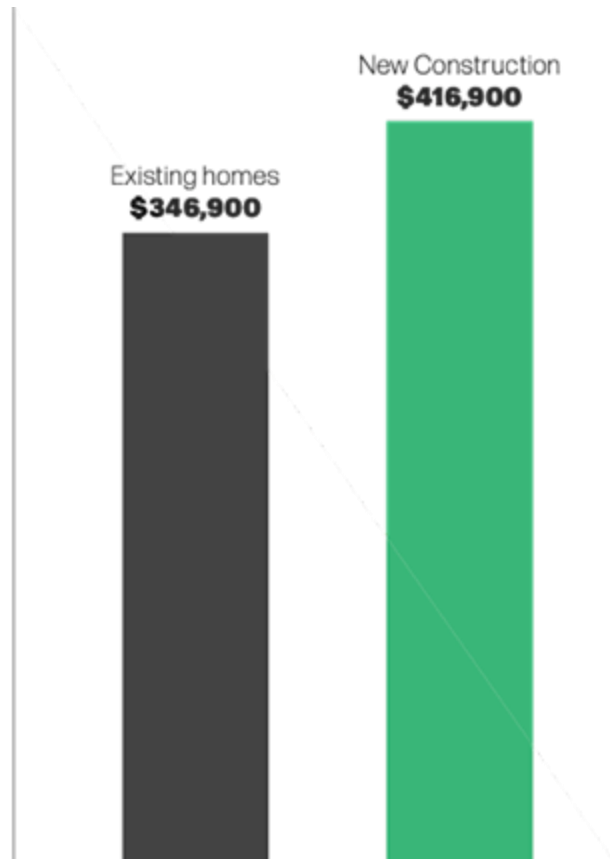
ALQUIST 3D MISSION

AT ALQUIST 3D (A3D) WE ARE AT THE FOREFRONT OF A CONSTRUCTION REVOLUTION. Through state-of-the-art 3D printing technology, we're pioneering innovative, stronger, faster and more cost-effective building solutions that are environmentally responsible.

Our dedication lies in revitalizing smaller communities, offering them sustainable and affordable living spaces. By harnessing the power of innovation, we are transforming economically distressed and under-served communities, providing them with the infrastructure they need to flourish.



MEDIAN HOME PRICES SOAR IN 2023



While existing home sales reached a median price of **\$346,900** in 2021*, up 16.9% from 2020, new construction home prices were even higher.

New construction homes hit a median price of **\$416,900** in November 2021, according to the US Census Bureau, about 19% higher than a year ago, and another new record.

**source: Home prices in 2021 rose 16.9%, the highest on record [cnn.com](https://www.cnn.com) January 20, 2022*

Millennials + Gen Z:

58% Missed important deadlines because of their Zillow browsing obsession

41% Zillow habit caused problems in their lives

56% Canceled plans with a friend to browse Zillow

49%

Admit they'd rather look for the homes of their dreams **than have sex.**

 **Zillow® & CHILL?**

Source: *Seattle Times* [Sex or browse Zillow? You house dreamers are not alone](#)

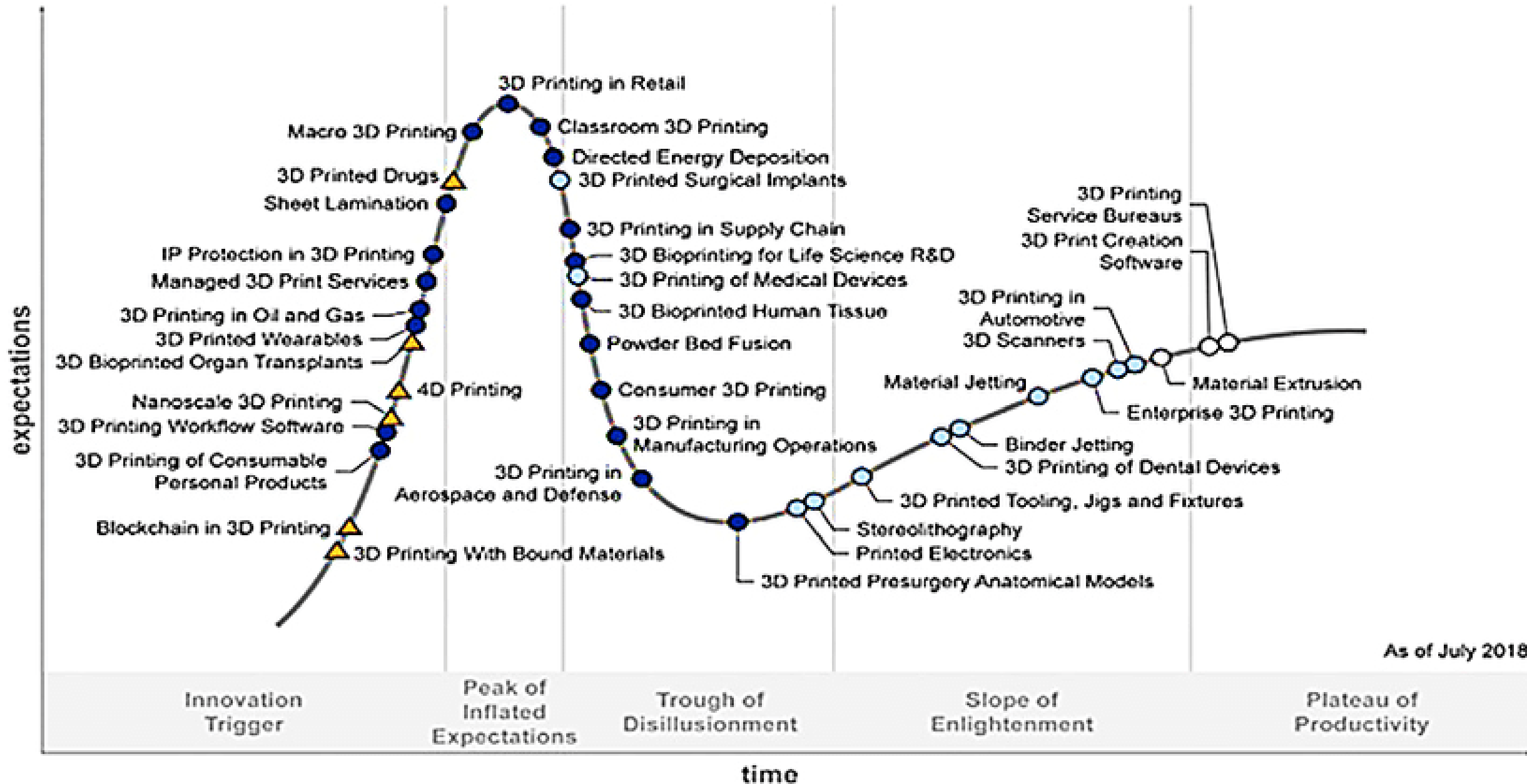




3DCP BRIEF HISTORY/FACTS



- 3DCP began in 1990's at various academic institutions in U.S., China, and Northern Europe
- First North American homes began being printed in late 2010's
- Fewer than 200 3DCP structures in U.S.
- Estimated 100-200 3DCP companies worldwide – majority are manufacturers
- Fewer than 20 3DCP companies in the U.S.



Plateau will be reached:

- less than 2 years
- ◐ 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau

A grayscale photograph of a construction site. In the foreground, a large KUKA robotic arm is mounted on a structure. A group of people, including workers in hard hats and safety vests, and a group of onlookers, are gathered around the machinery. The background shows a construction site with rebar and other structures.

ALQUIST HOME #1

**HABITAT FOR
HUMANITY**

WILLIAMSBURG, VA

The First 3DCP Home in America that is Owner Occupied

12/21: Dedication for the Stringfield
Family of Williamsburg, VA





 ALQUIST





3D PRINTING ADVANTAGES

TIME

Reduction in home framing by 2-4 weeks*

LABOR

Less human capital on site*

MATERIAL

Cost for concrete and other printing materials can be less than traditional lumber*

ENERGY

than

3D printed homes use less energy than traditional homes

WASTE

80% less on-site waste is accumulated

DESIGN

and structures

3D technology allows for easy customization of homes

DURABILITY

3D homes are expected to survive tornadoes, hurricanes, flooding, fire, and ballistics*

LOCAL CODES

Homes are built traditionally around the 3D walls and pass all local codes*

COSTS

3DCP homes *are not* lower cost than traditional stick-built homes *yet**



NEW ROBOTS: Machines need to move faster and become lighter/easier to maneuver, travel, setup, and breakdown

EXPERIENCE: Training programs for 3D printing operators, material designers, and advances in technology

LOCALIZED MATERIAL: 3DCP material needs to become more sustainable, environmentally friendly, and made with local resources

PREFAB VS. ON SITE: Marrying the worlds of prefabricated, modular housing and printing on site

RESEARCH & DEV: More support from public sector for testing against weather, structural support, green material, etc and more sharing of data in the industry (i.e. trade union)

PRINTING BEYOND HOUSING: More equitable ways to print infrastructure, commercial properties

***VITAL**

INDUSTRY CHANGES





ROBOTICS



NEW TECHNOLOGY
Moving from Gantry to Robot Arm



MATERIAL



- **Stronger than traditional concrete by at least 3x:** Average PSI 7,000 with faster print and set times.
- Manufacture locally
- Get below \$200/cubic yard
- Become Carbon Negative
- Need training for Trade Unions





3DCP BUILDINGS &
INFRASTRUCTURE



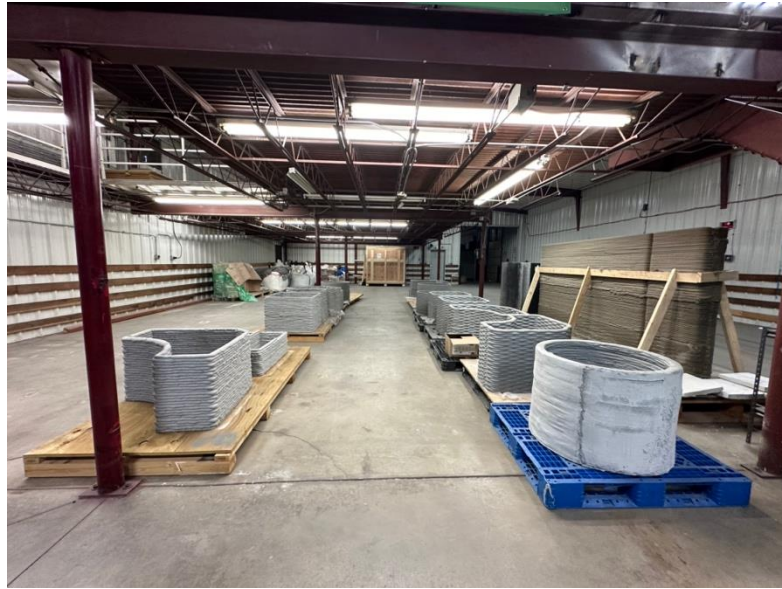
INFRASTRUCTURE IN WAREHOUSE

- **2 People**
- 1 - Robotic Arm Printing system
- 1 Pump/Mixer
- Material

INFRASTRUCTURE CONSTRUCTION

3DCP has capabilities to **print an assortment of infrastructure needs** including gutters, sidewalks, and retaining walls









WHAT/WHO IS ALQUIST?

The name Alquist goes back to founder Zachary Mannheimer's theater background. Alquist is a character in the 1920 satirical play R.U.R. (Rossum's Universal Robots) by the Czech playwright Karel Čapek. R.U.R. was the first piece of literature to coin the term "Robot".

In the play, "robots" are invented to speed up Rossum's manufacturing facility. Over time the robots take on human emotion and revolt over their conditions, leading to an epic battle of robot vs. human. Alquist, the main engineer, is the only character in the story who believes that humans and robots can co-exist peacefully. He is spared by the robots and charged with forging ahead a new robot/human peace.

Picture: from the BBC broadcast of R.U.R. in 1938

WORKFORCE DEVELOPMENT

- Gateway to other trades
- Collaboration with Aims Community College
- Spreading curriculum to other trade schools and universities





WORKFORCE DEVELOPMENT: The Biggest Opportunity

Alquist believes 3D concrete printing is a gateway innovation to encourage young people back into the trades. Aims Community College, based in Northern Colorado, has entered a strategic partnership with Alquist to do following:

- Collaborate with Alquist to build certificate courses for job training and workforce development
- Locate Alquist on the Aims Campus through a proposed residency in the new Aims Workforce Innovation Center (AWIC) coming in 2026!
- Collaborate with students and faculty on future projects and creations



PROJECT ACQUISITION

All projects start by going through this phase. It is here where the project scope and budget is established.

DESIGN ASSIST

We will use our prior experience to guide your team through turning your design into a printable structure.

SURFACE MODELING

Our team will use the finalized plans to create a 3D-dimensional model of the printable wall system.

TOOLPATH CREATION

It is here where the 3D model is sliced into hundreds of layers, and coordinates are assigned to critical points throughout the design.

3DCP BUILDINGS & INFRASTRUCTURE

PRINT PROCESS

SCALABILITY

This print process is scalable to any 3DCP need including both **infrastructure** and **housing** projects.

OPTIMIZATION

If the simulation process returns any critical errors, our team will reevaluate the model to remedy the issue.

SITEPLAN

Using a digital twin of our equipment, and available site information, a site plan is created for the project.



DIGITAL SIMULATION

Simulations are run to verify machine movement, collision detection, material usage, and other critical information is collected.

3D-PRINTED CONSTRUCTION

An Alquist-certified print team will operate the printing equipment until the structure has been completed. Once complete, the Alquist team will disassemble and remobilize the machine to its next location.

MOBILIZATION

Once all plans have been established, The print team will mobilize and begin the setup process.

3DCP Curriculum



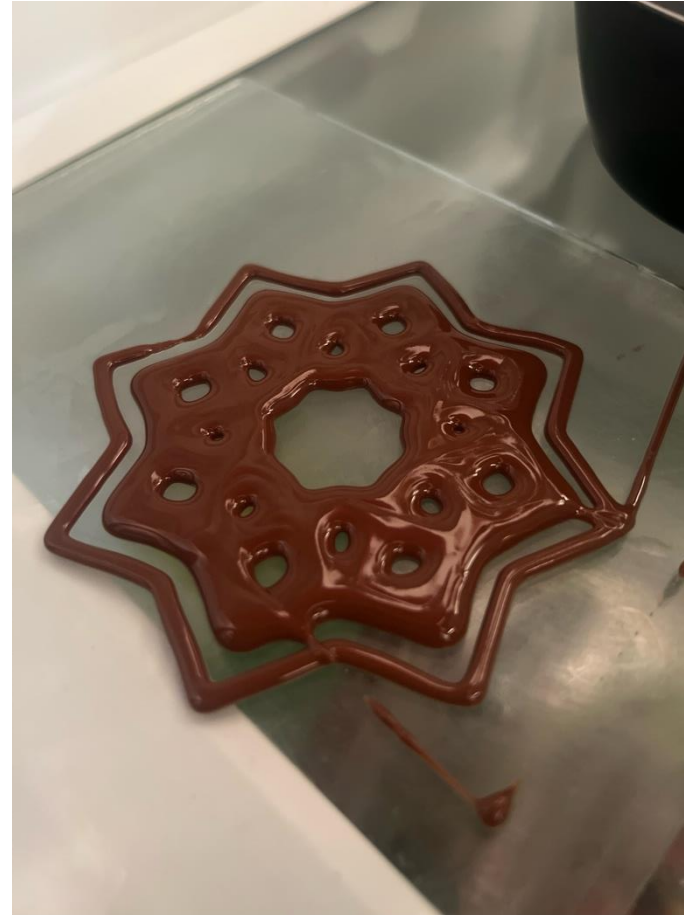
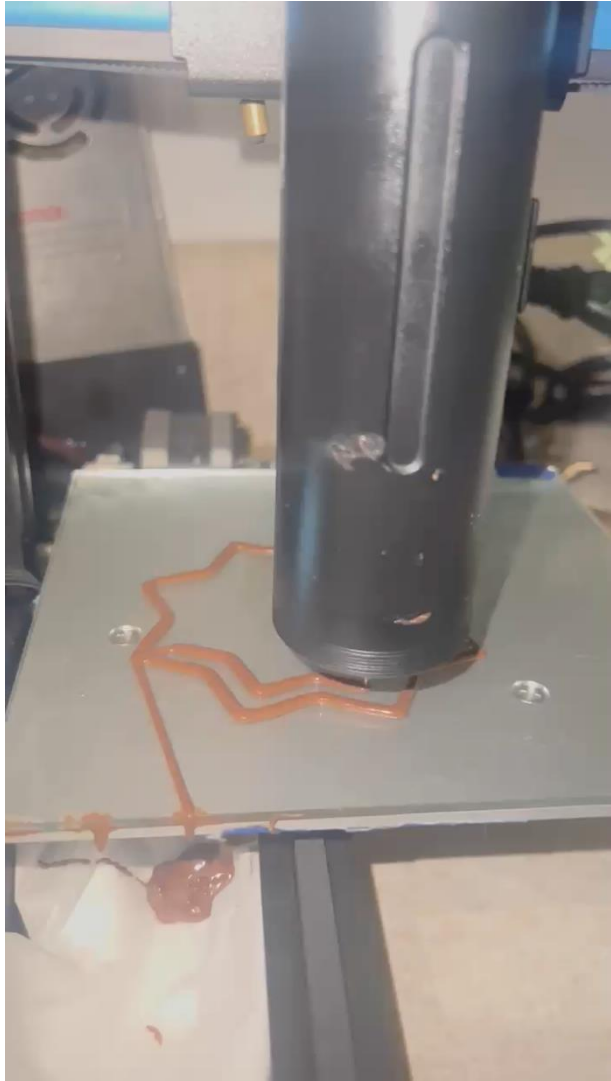
- College adopts curriculum to create local workforce pipeline
- Partnership with local GC and/or Developer
- Determine regional licensee territory
- Alquist trains the trainer and GC
- Students go directly into workforce to create Economic Ecosystem

WHAT'S NEXT FOR 3DCP

- More full neighborhoods at scale
- Infrastructure and commercial units printed
- Vertical multifamily housing
- Lower amount of steel reinforcement
- Greener, locally sourced, recycled, carbon negative material
- Storm, earthquake, fire, and flood resistant homes and infrastructure
- All of the home 3D printed out of various materials (plastics, glass, metal, wood)
- Changes, repairs, and new designs done online in both real and virtual worlds
- Thousands of new jobs and companies formed
 - **Which you will learn about at our Salon!**



DELICIOUS PRINTS



7,900 sq. ft.
20 feet tall



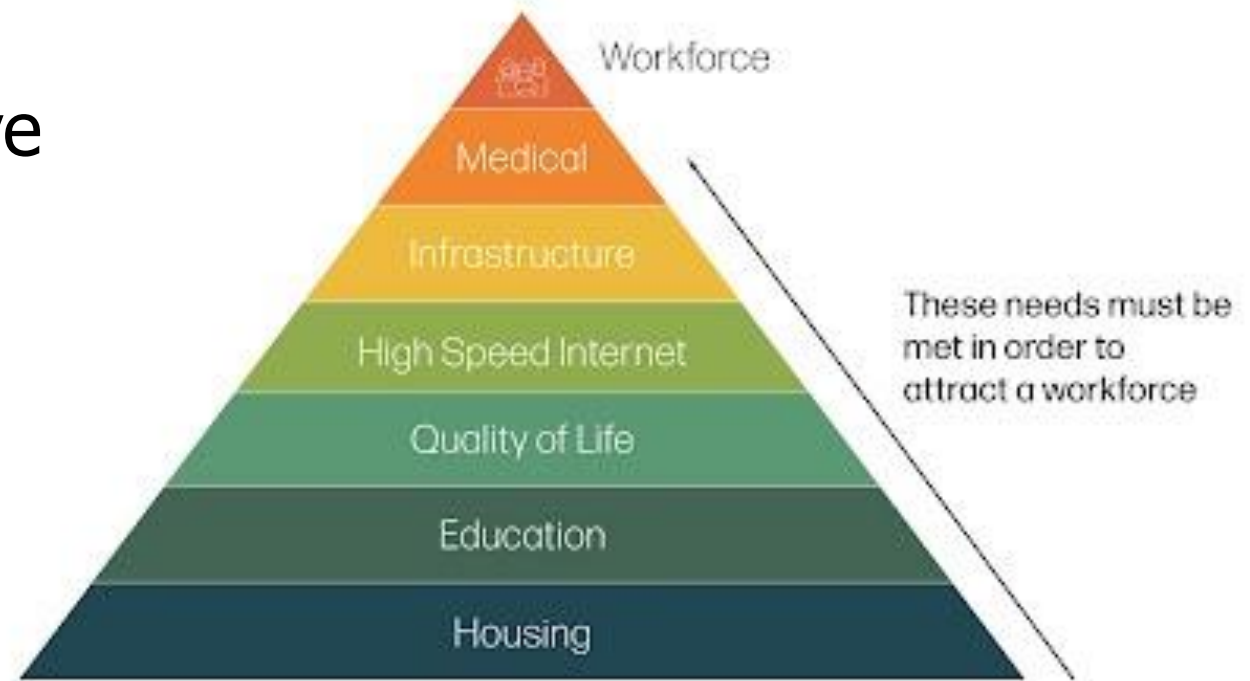


30' x 10' in 6 hours



15,000,000 AMERICANS ON THE MOVE BY 2026

Will your community have the housing and entrepreneurship to welcome them?



“The remote work revolution promises to change the way that Americans work and live. It will allow smaller cities, suburbs and rural areas to compete with the superstar cities on the basis of price and amenities. It will shift the main thrust of economic development from paying incentives to big employers to investing and building up a community’s quality of life. As communities attract more remote workers, their tax bases will grow, allowing them to improve schools and public services, benefiting everyone. Eventually, companies will come too. That holds out the possibility of a better, virtuous circle of economic development.”

Richard Florida | *University of Toronto School of Cities*
Wall St. Journal, March 6, 2021



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