

Future Earth/ Future Cities



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120

Mississippi River
Visitor Center



See You
at the Lakes







CANADA

Lake of the Woods

Rainy River

Upper Red Lake

Lower Red Lake

Mesabi Range

Sawtooth Mountains

Lake Superior

Red River Valley

Grand Forks

Fargo

Moorhead

Grand Rapids

Duluth

Mississippi

Leech Lake

Mille Lacs Lake

St Croix River

St. Cloud

Minneapolis

St Paul

Minnesota River

Mankato

Mississippi River





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120

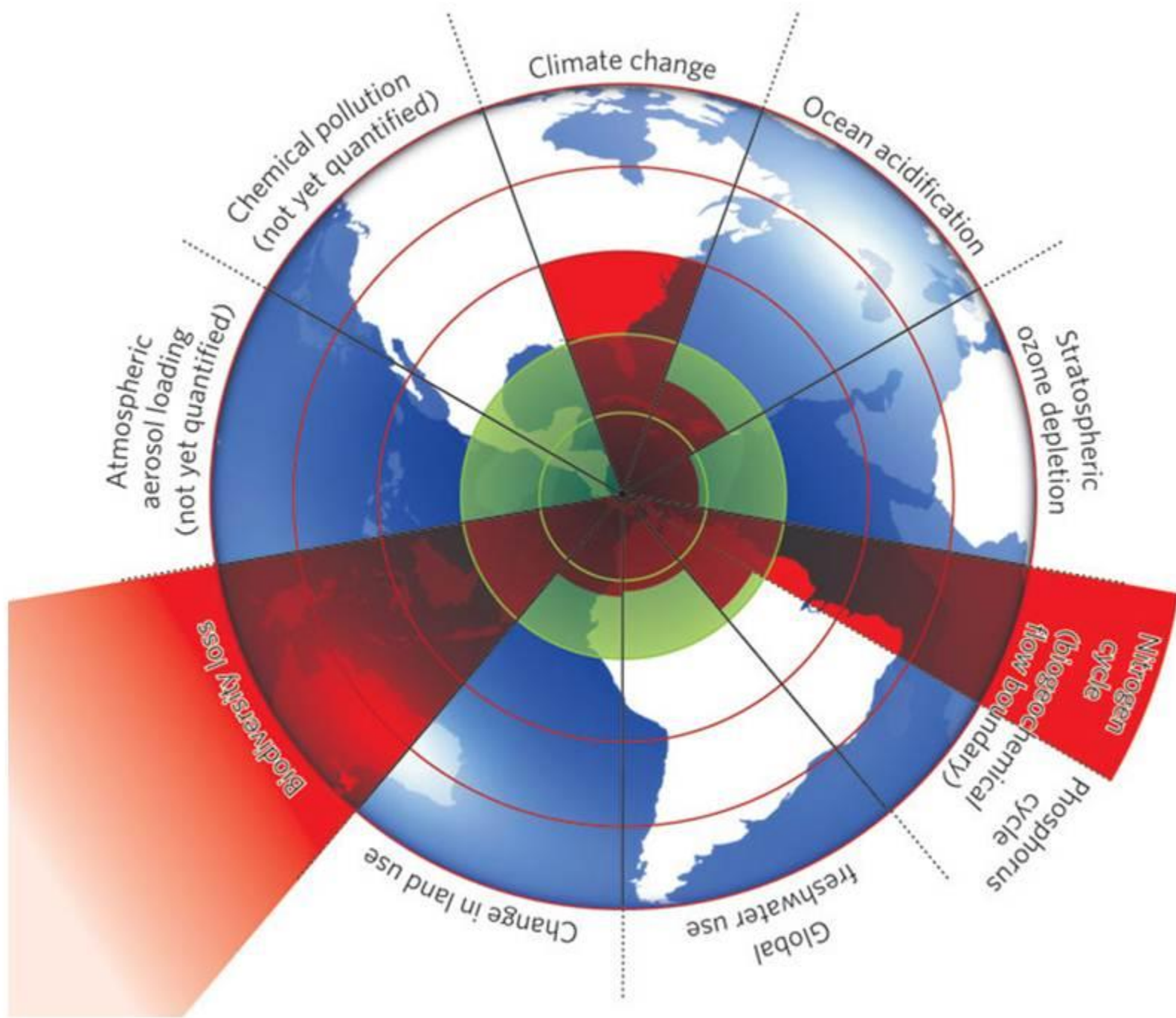
Mississippi River
Visitor Center

1. We dominate the planet.

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2. We have tremendous assets.

1. We dominate the planet.
2. We have tremendous assets.
- 3. We must innovate now.**

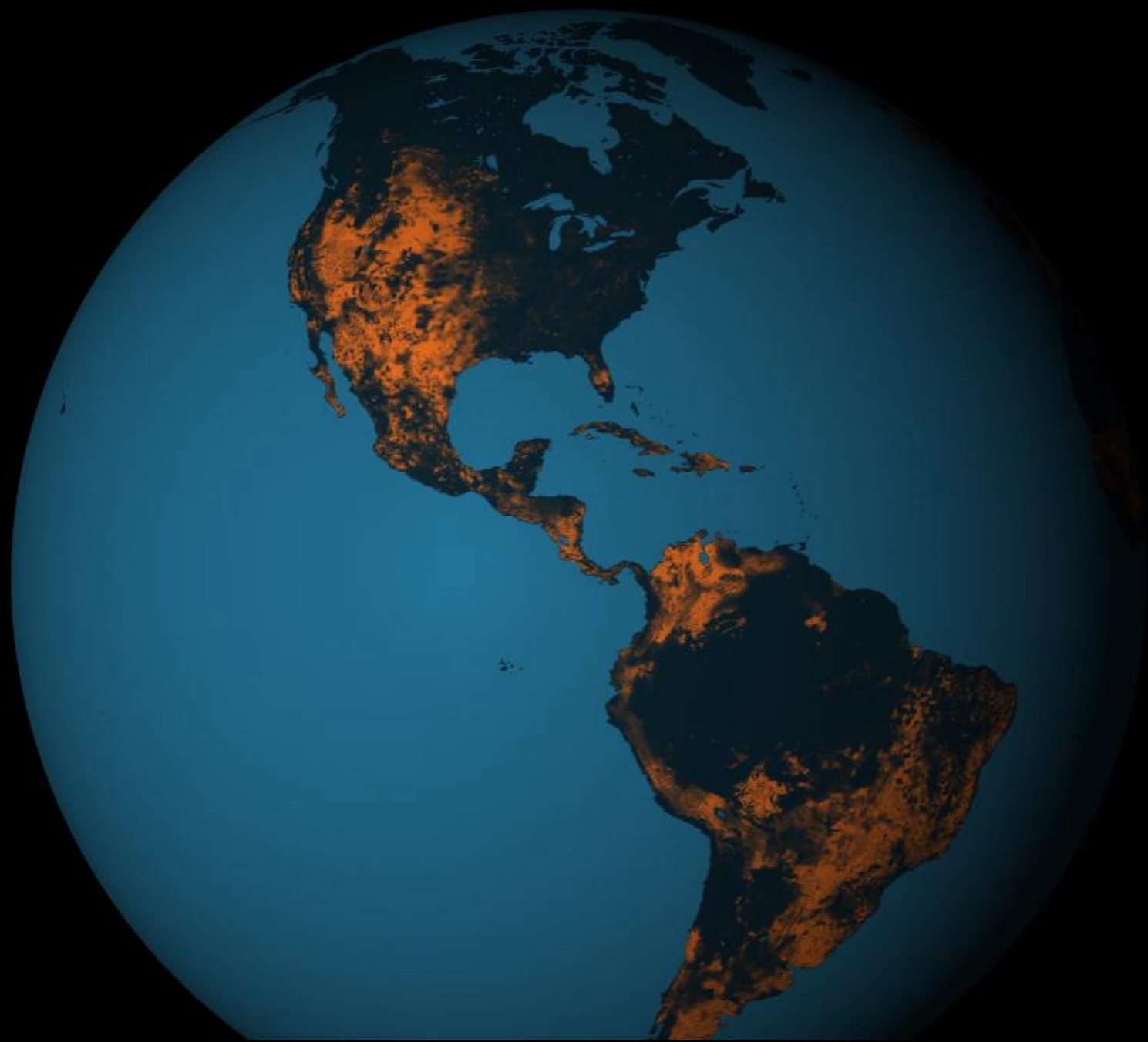


Global Change

The Land







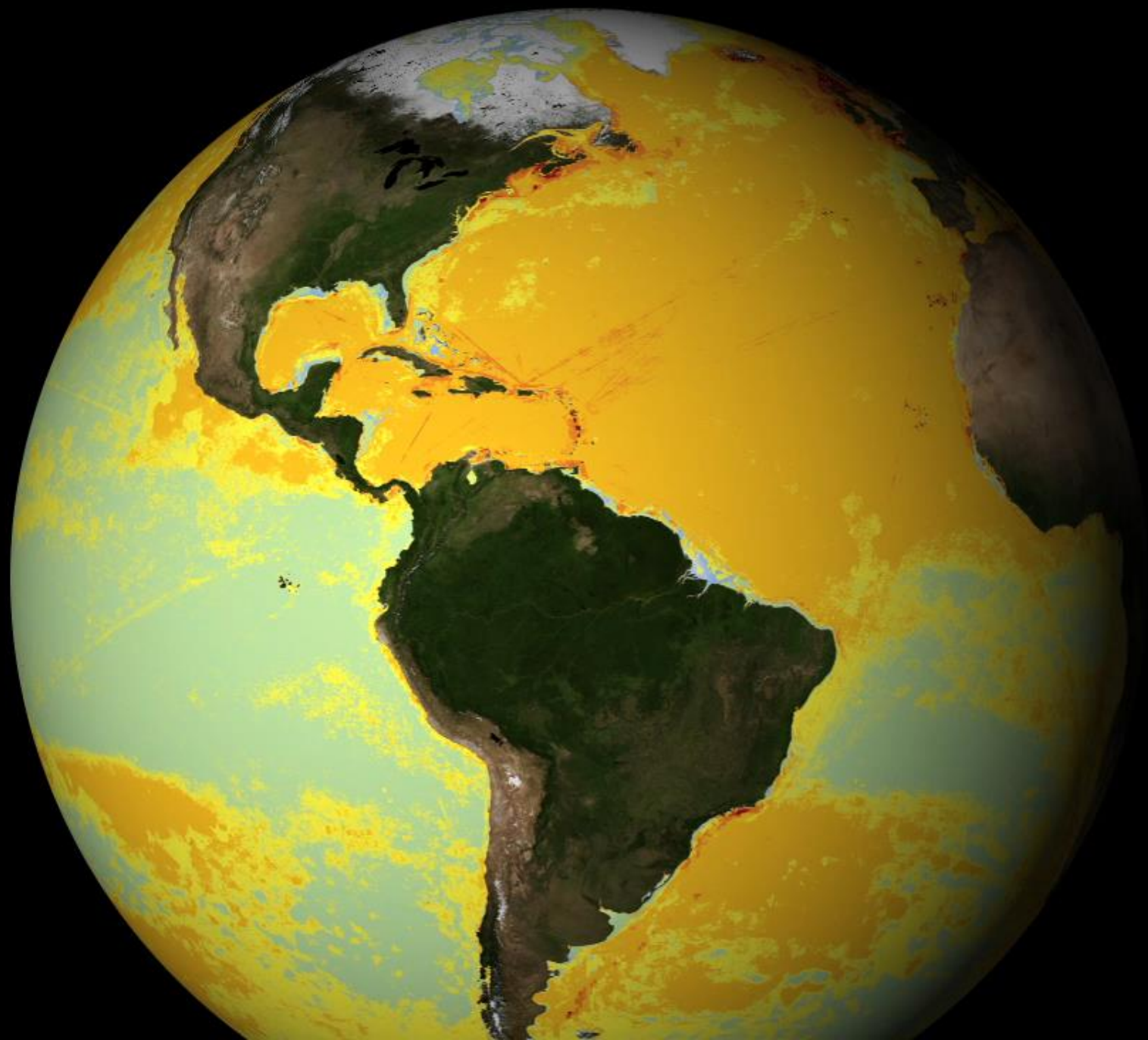
40% of all ice-free land

7.8 billion (2020) → 9 billion (2050)

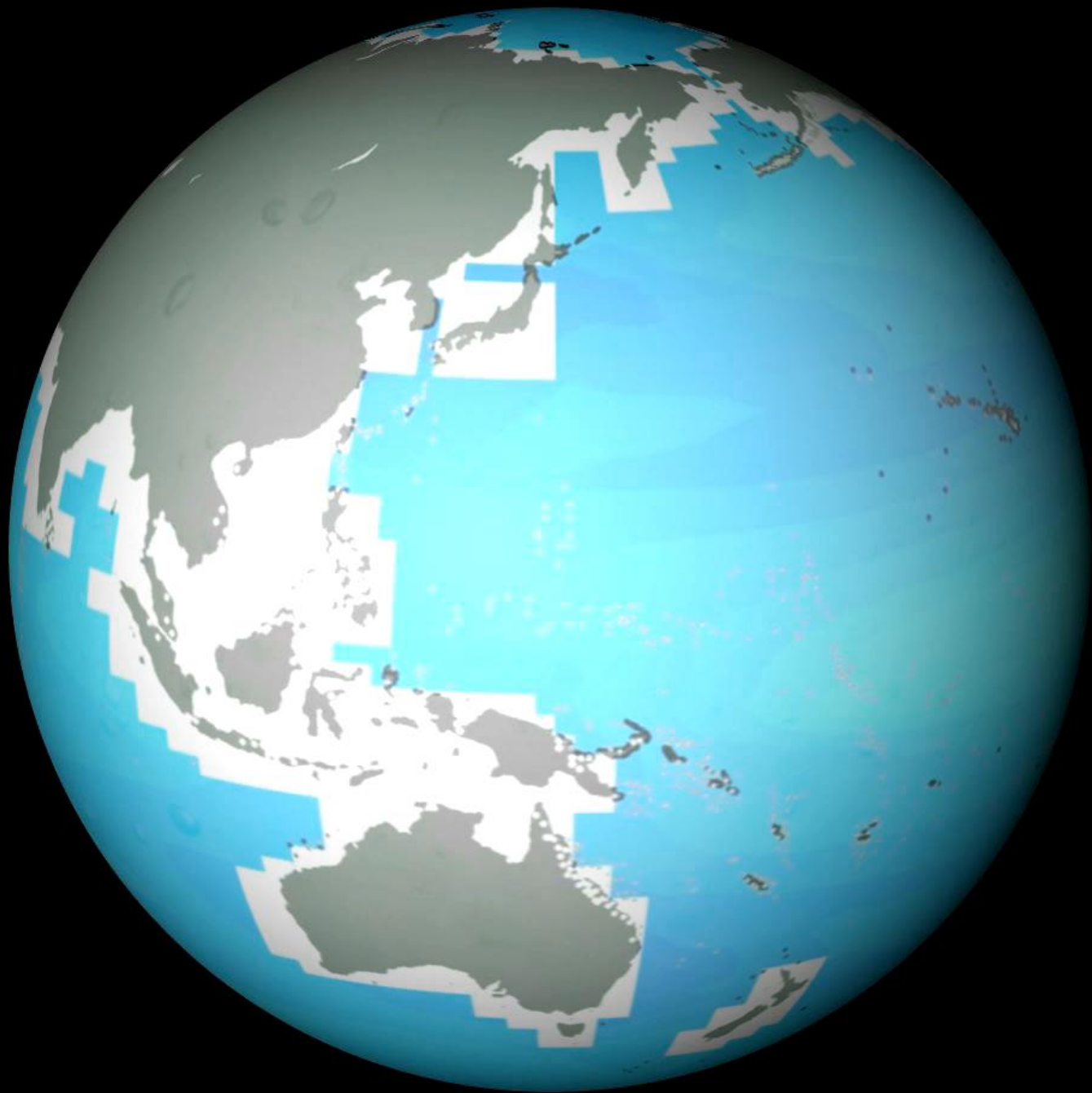
Global Change

The Ocean









Global Change

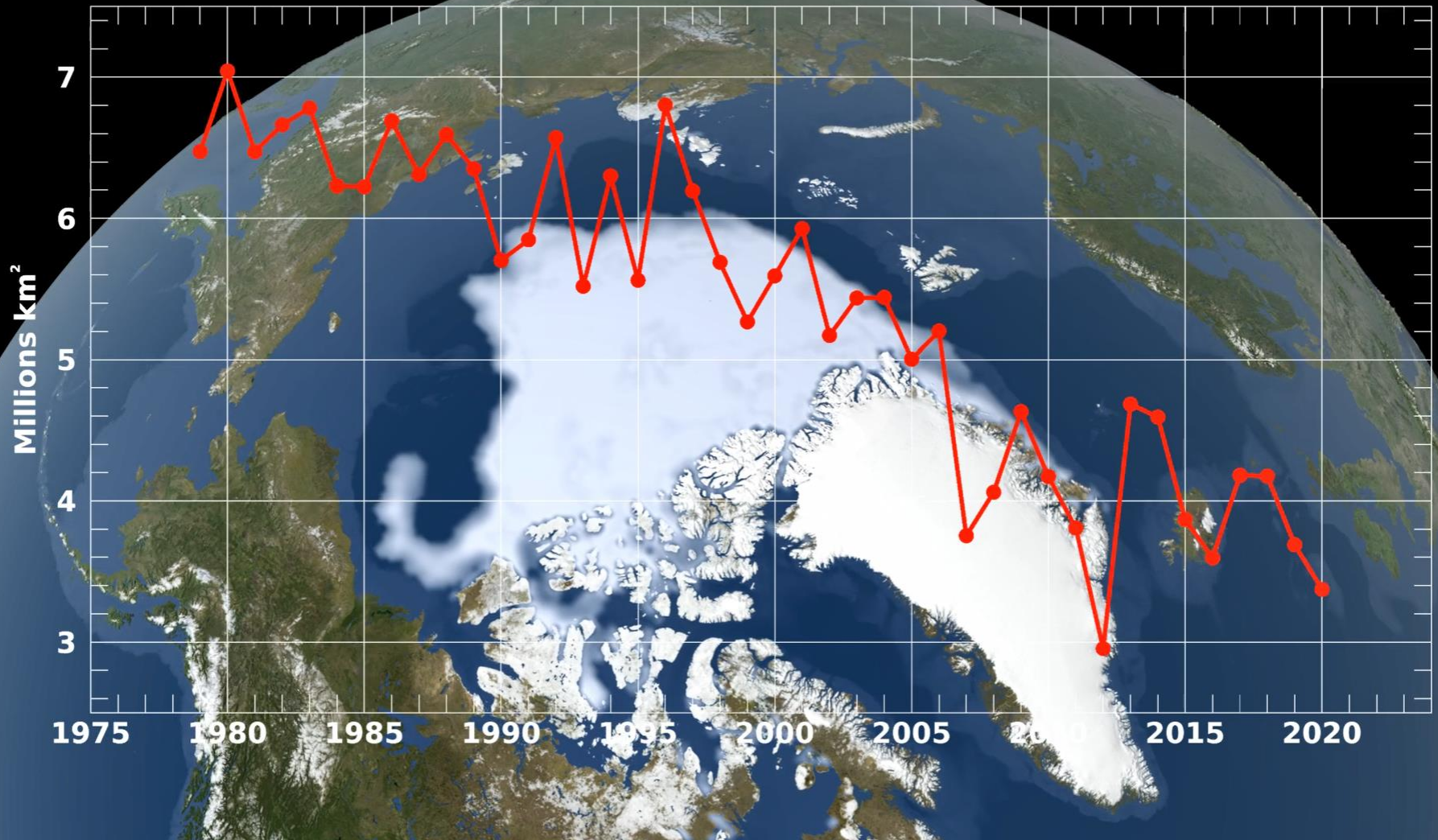
The Atmosphere





1896

Annual Arctic Sea Ice Minimum Area



Global Change Implications for Minnesota

Forests





Source: StarTribune

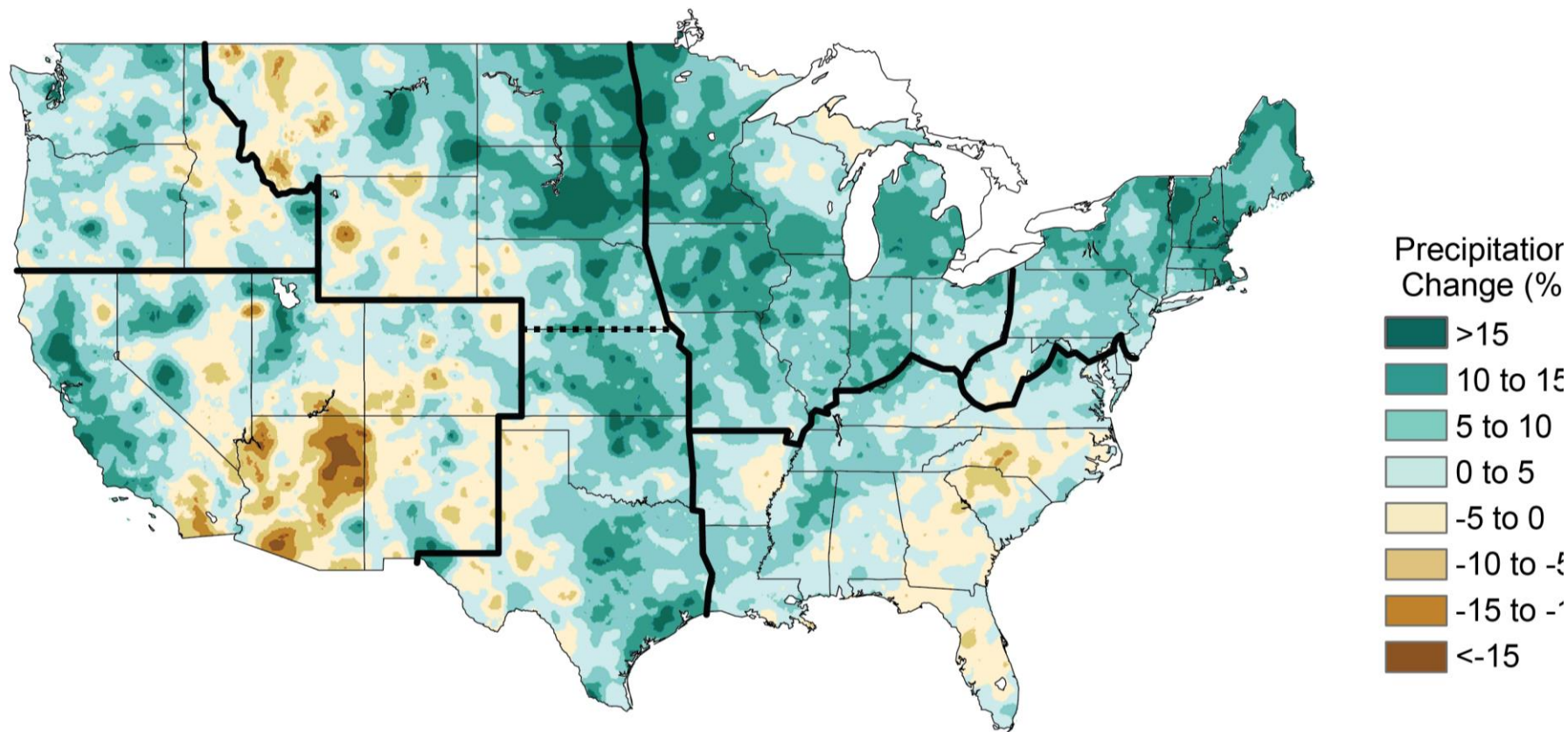


Global Change Implications for Minnesota

Croplands

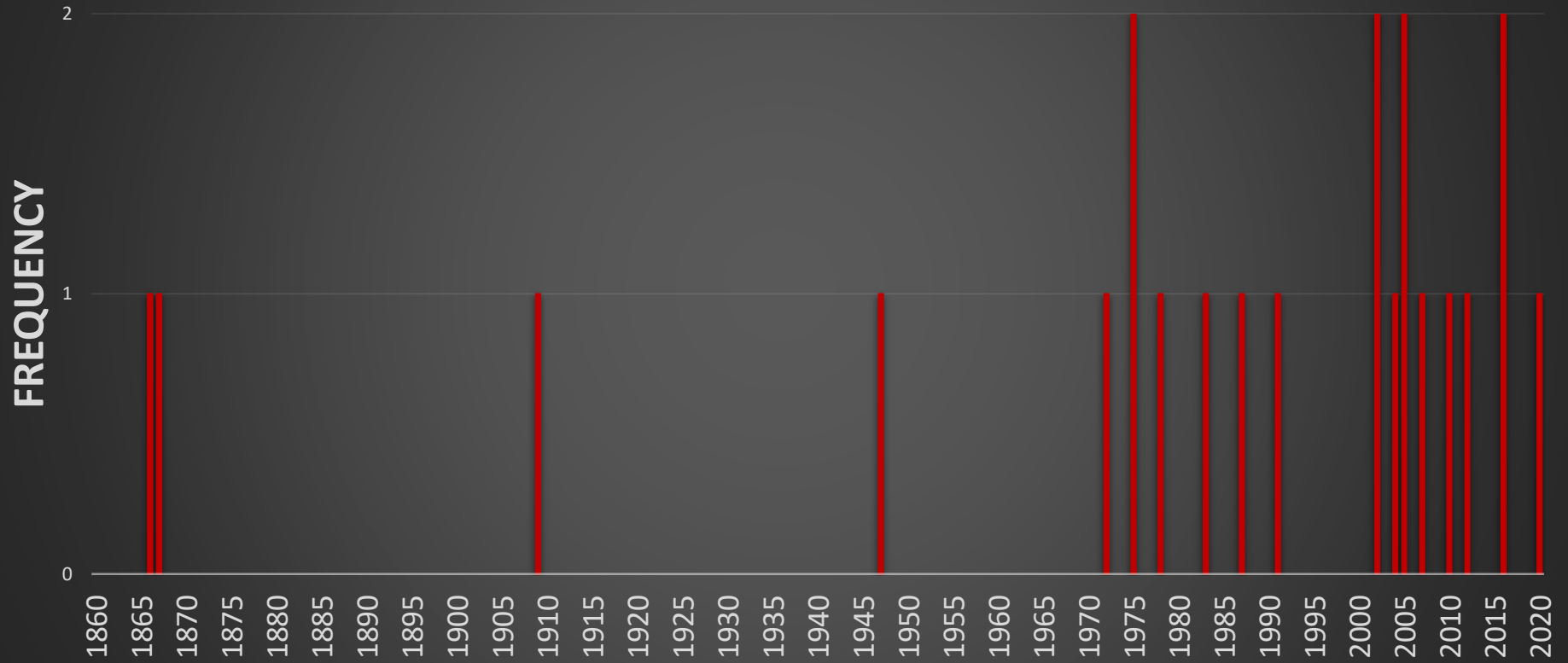


US Precipitation Change Since 1900



**National Climate Data Center, National
Oceanic and Atmospheric Administration**

Minnesota's Extreme Rainfalls





Courtesy Pat Baskfield, Minnesota Pollution Control Agency

Global Change Implications for Minnesota

Lakes & Rivers





Jenn Ackerman for The New York Times



Jim Mone/AP

Global Change Implications for Minnesota

Cities





Duluth News Tribune



This increase in heavy and extreme rain is one indication that our climate already is behaving substantially differently than it has in recorded history.

Kenny Blumenfeld, Ph.D.

Senior Climatologist

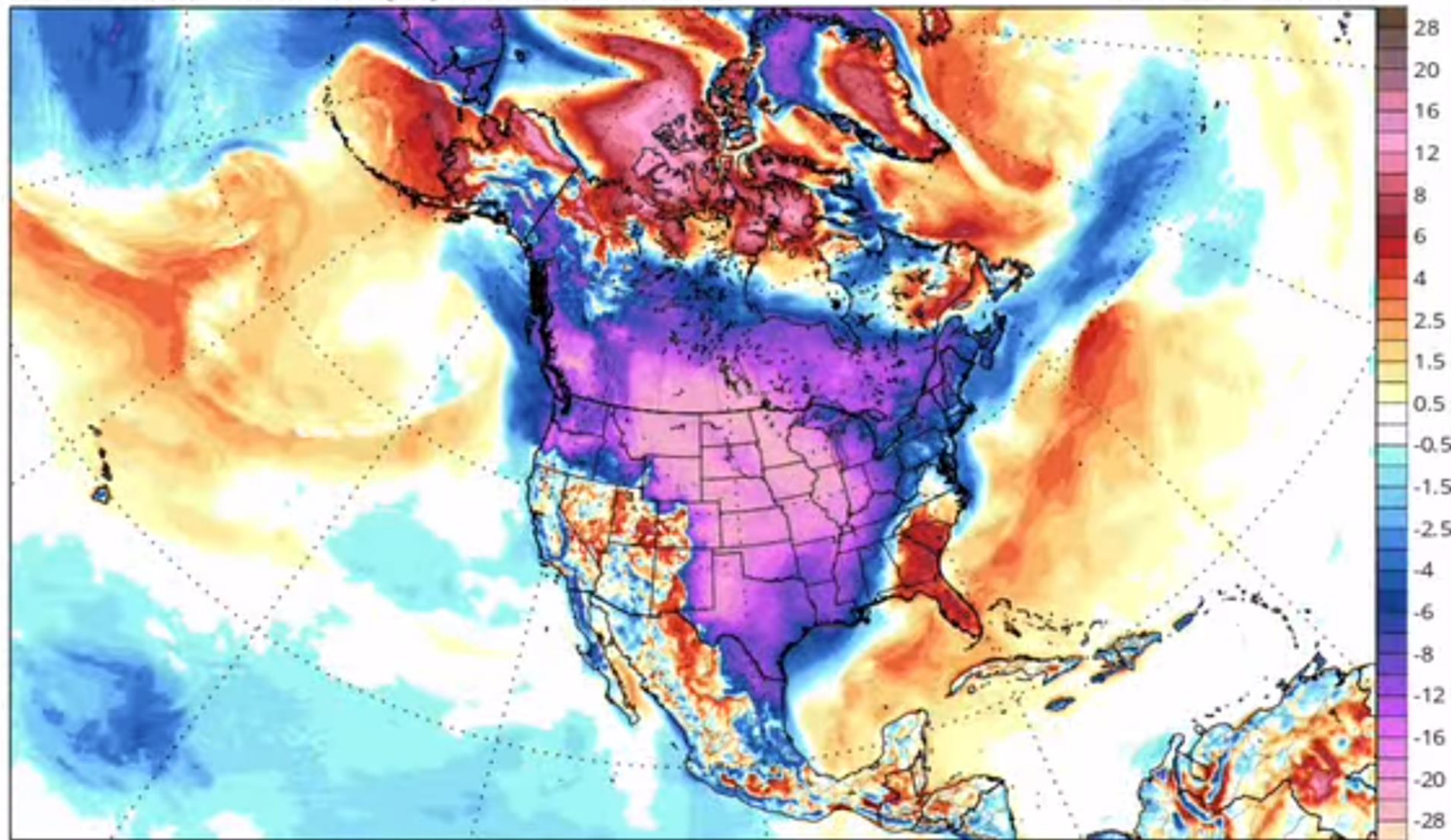
State Climatology Office

Minnesota Department of Natural Resources

GFS 2-meter Temperature Anomaly ($^{\circ}\text{C}$) (based on CFSR 1981-2010 Climatology)

Init: 12z Feb 07 2021 Forecast Hour: [132] valid at 00z Sat, Feb 13 2021

TROPICALTIDBITS.COM



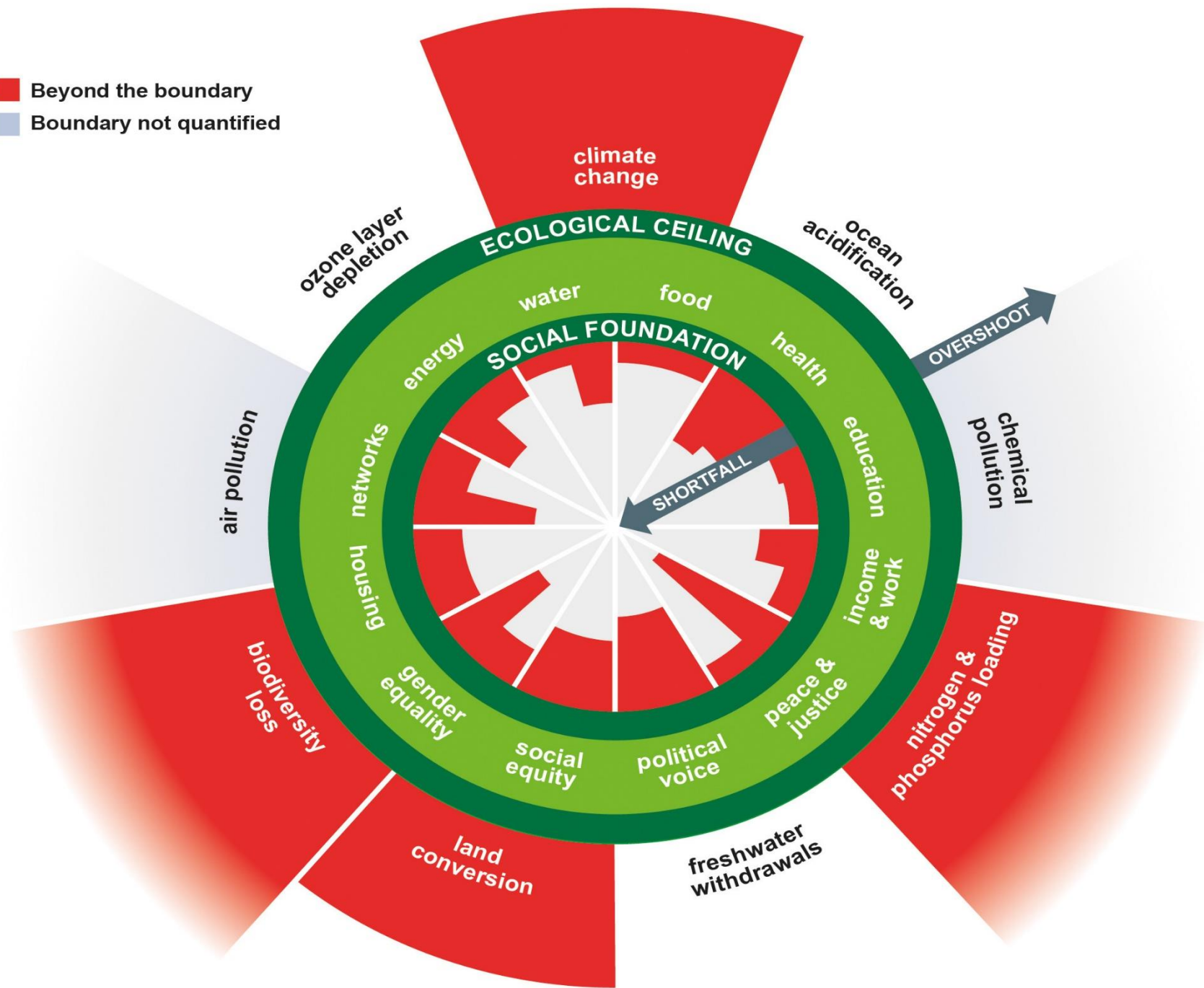


How Cities Can Foster Innovation and Make Markets

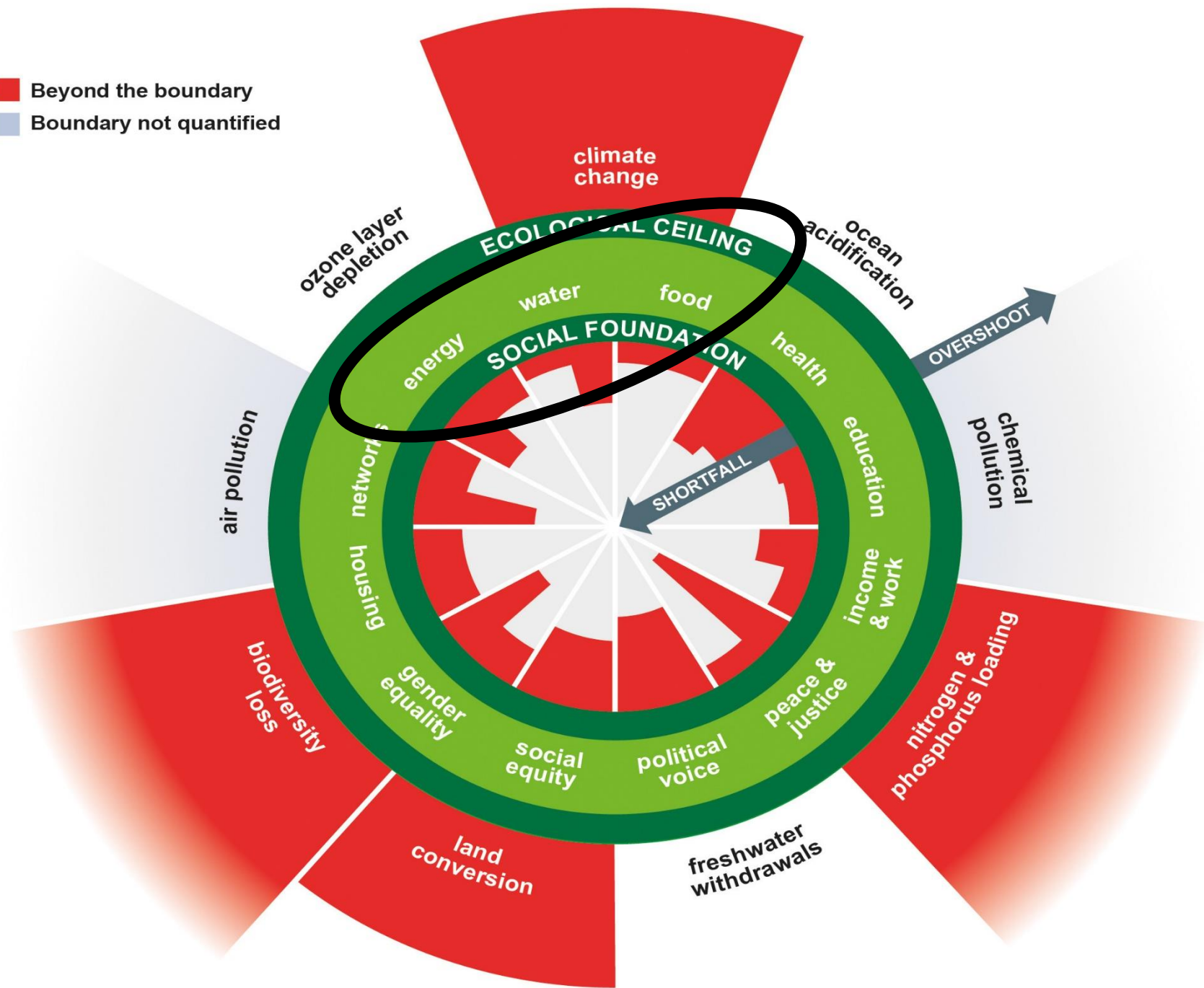
The Present



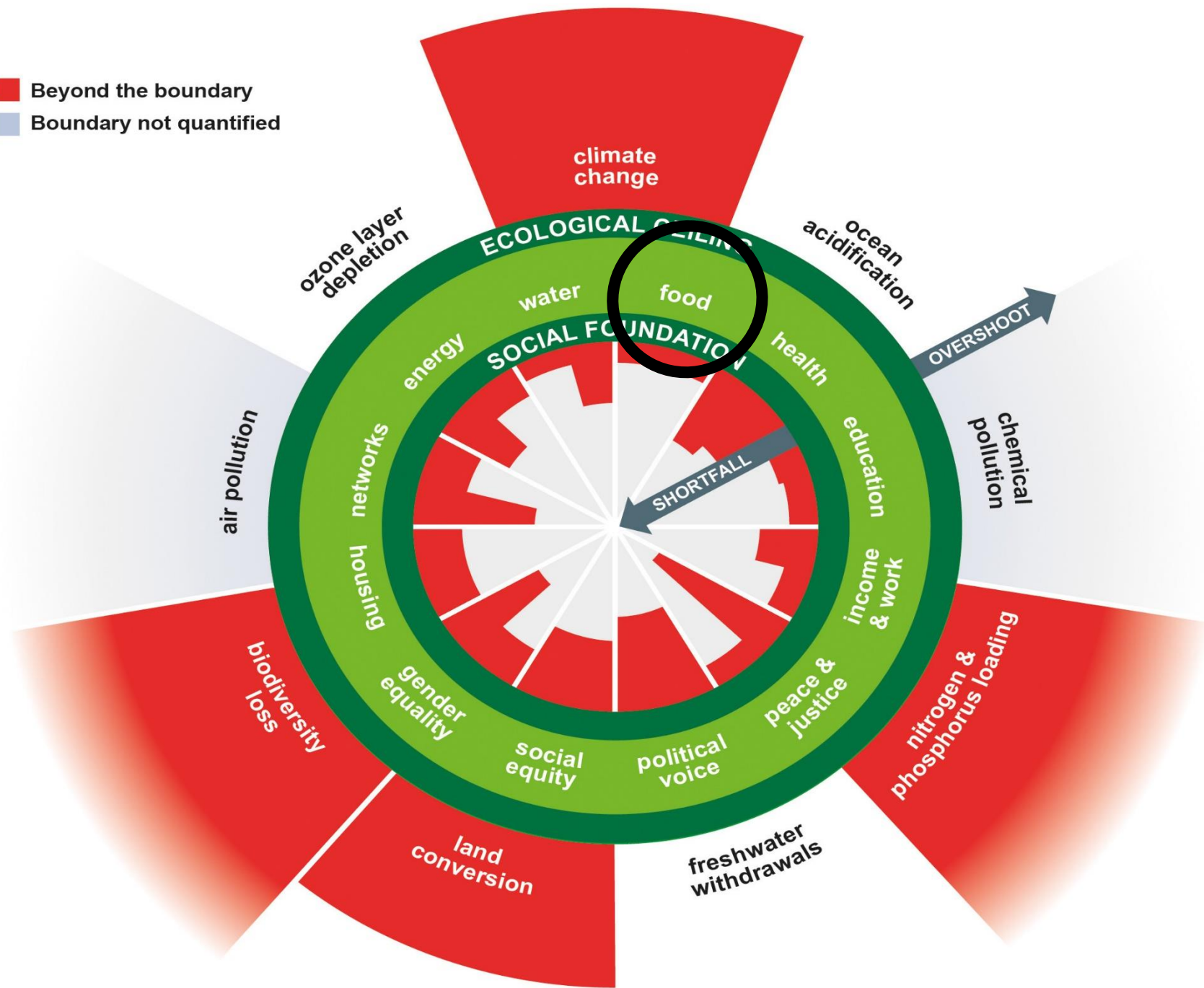
- Beyond the boundary
- Boundary not quantified



- Beyond the boundary
- Boundary not quantified

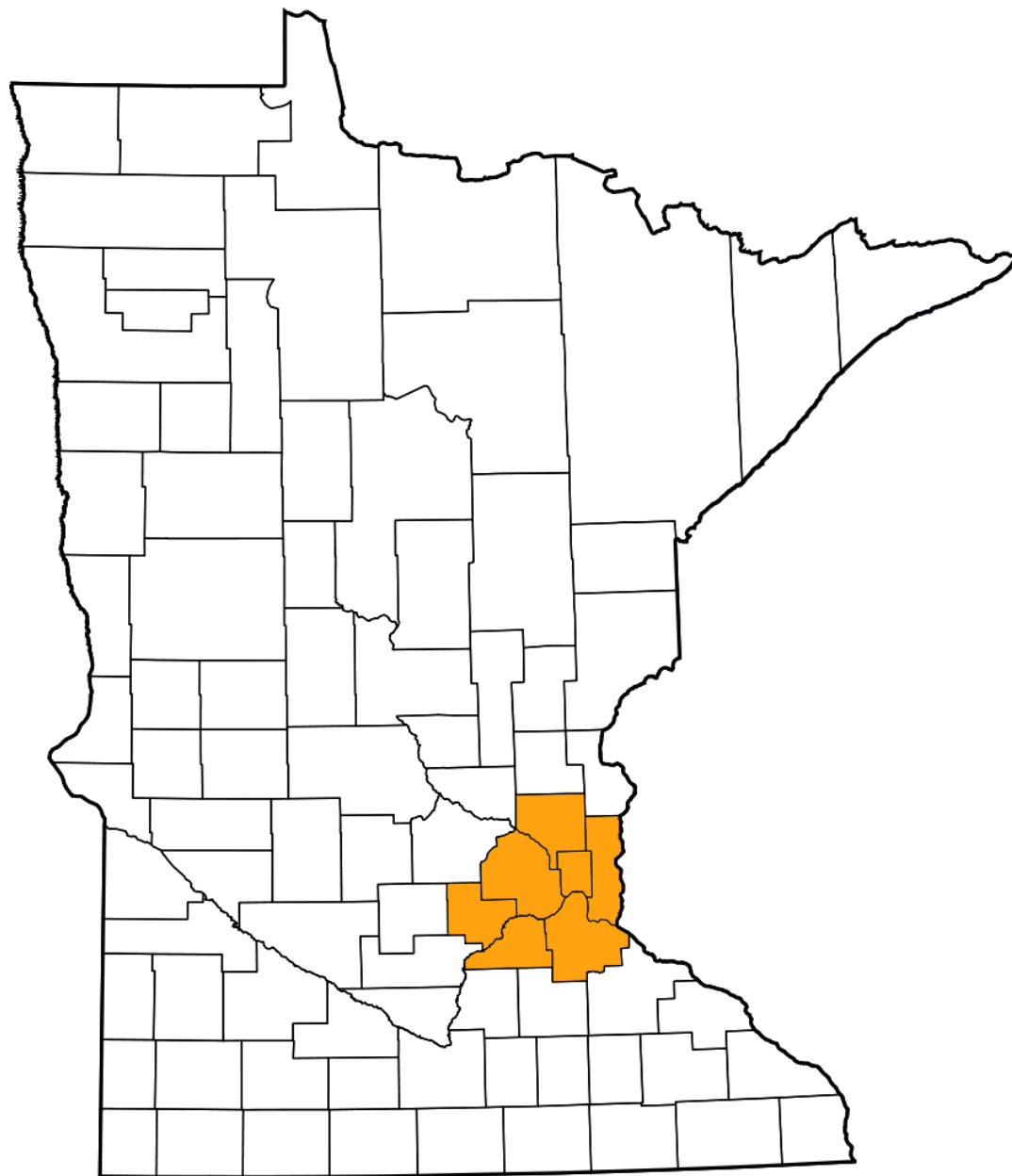


- Beyond the boundary
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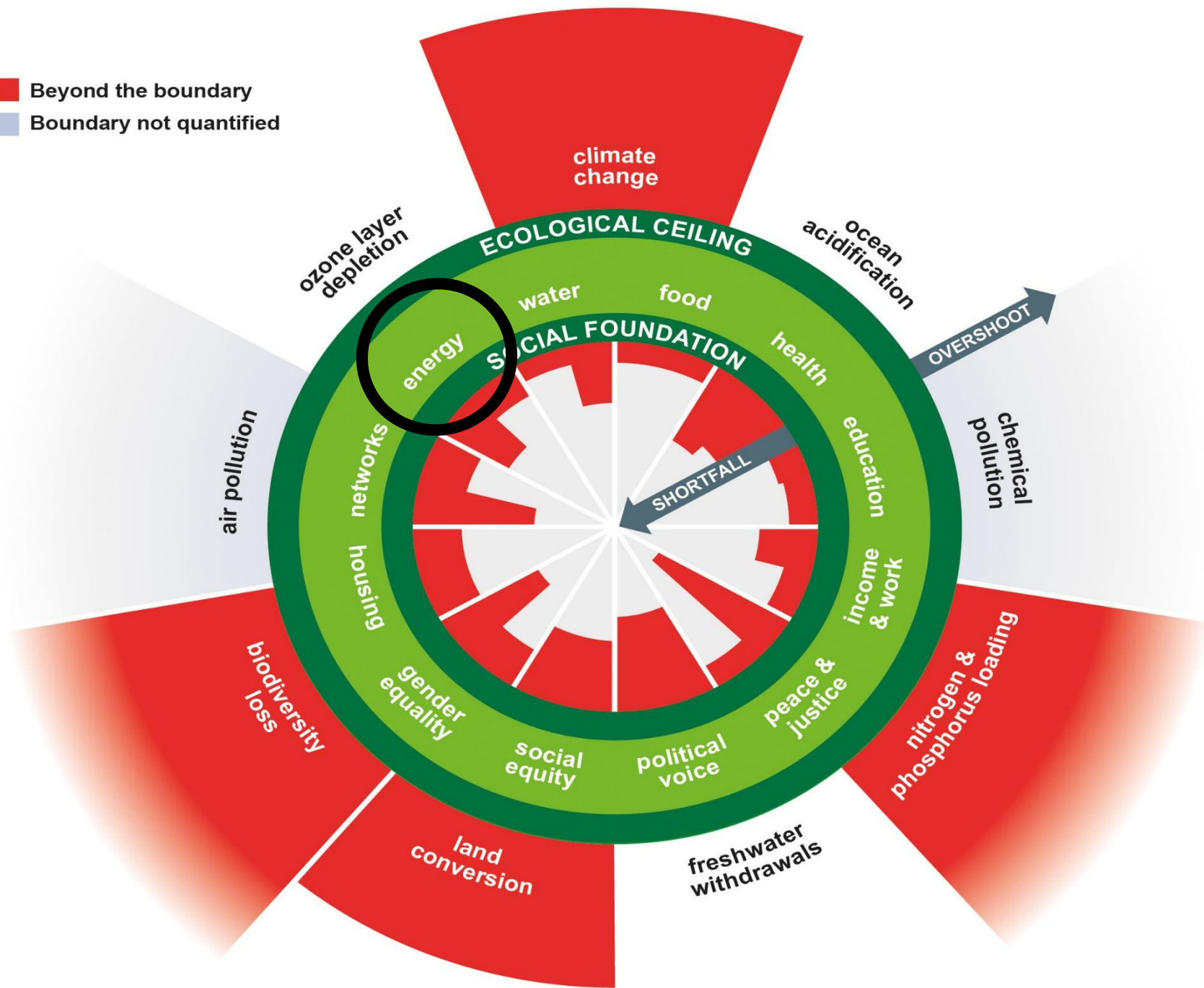








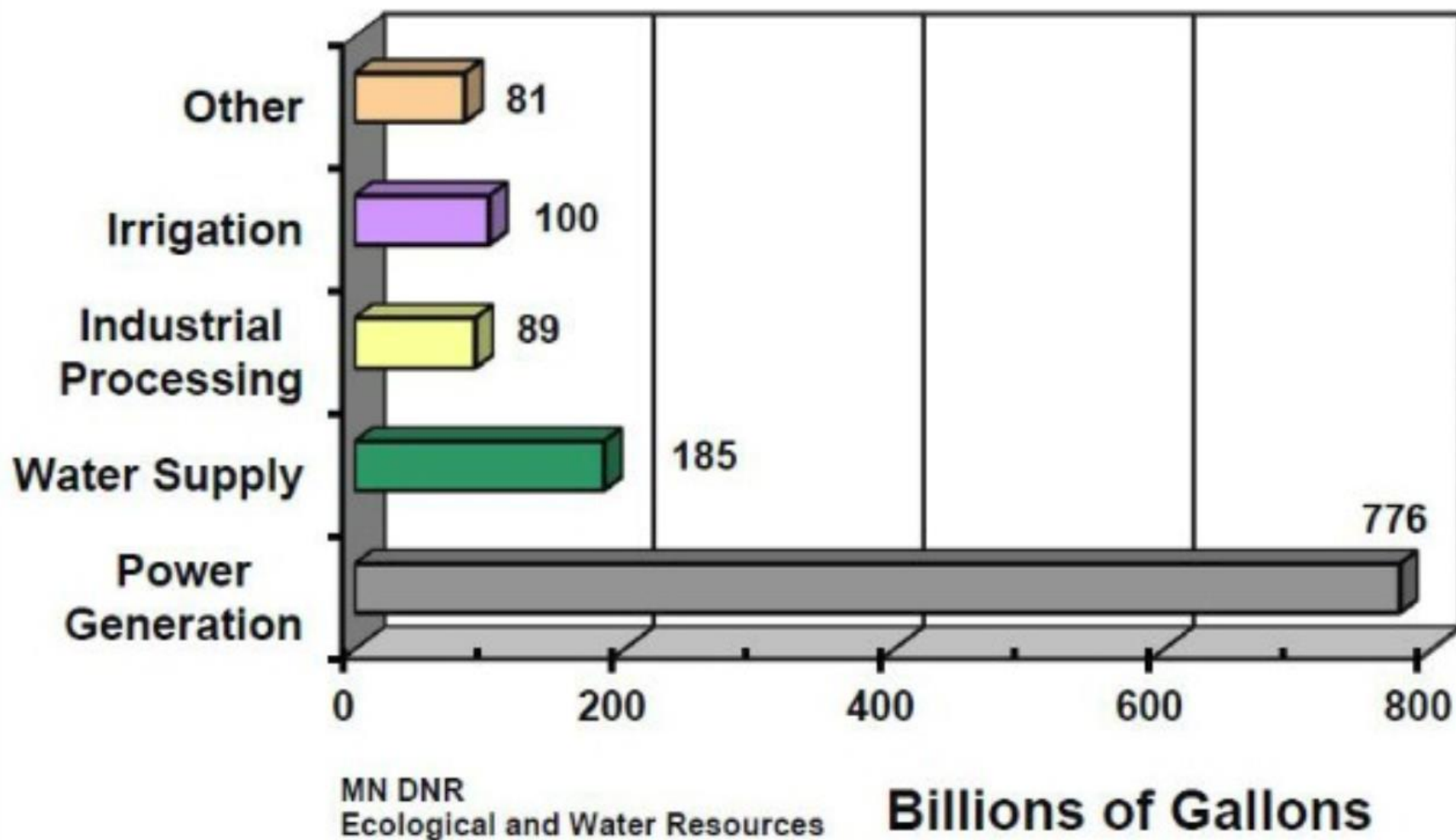
- Beyond the boundary
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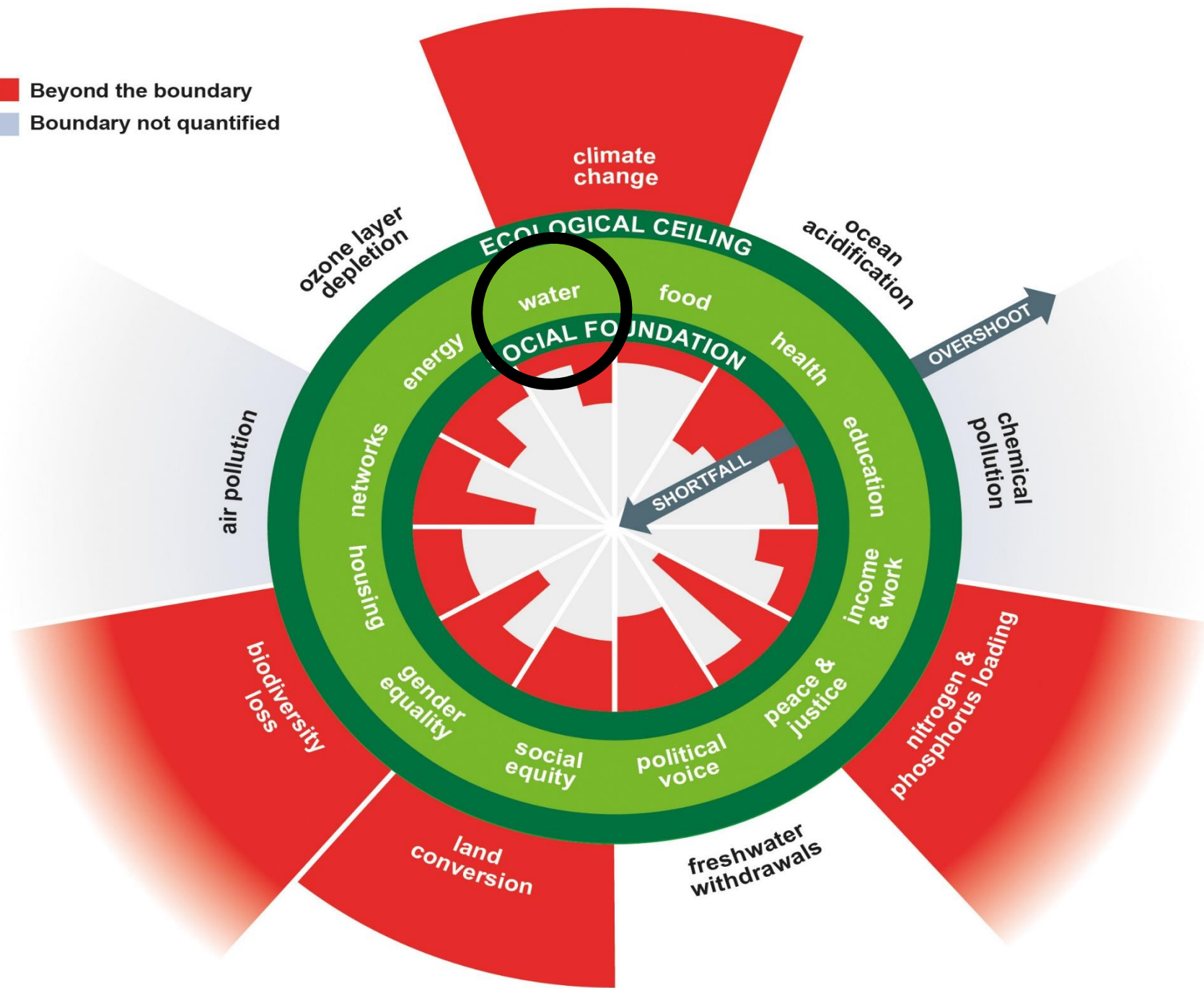




Minnesota Water Use 2016

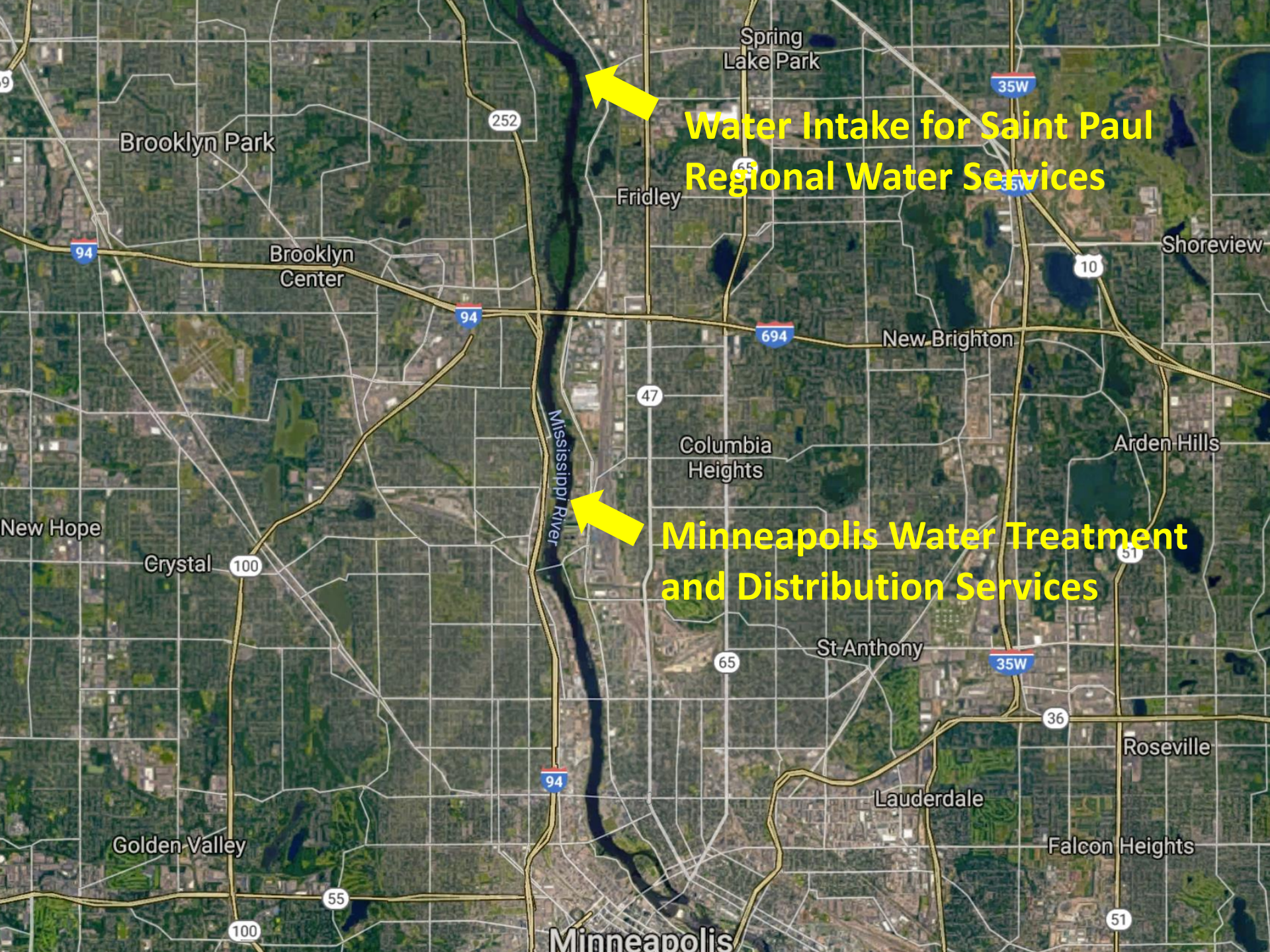


- Beyond the boundary
- Boundary not quantified





Courtesy StarTribune



**Water Intake for Saint Paul
Regional Water Services**

**Minneapolis Water Treatment
and Distribution Services**

Minneapolis

Crystal

New Hope

Golden Valley

Edina Morningside

Hilltop

Columbia Heights

MSP Airport

Saint Paul

Falcon Heights

Lauderdale

Lilydale

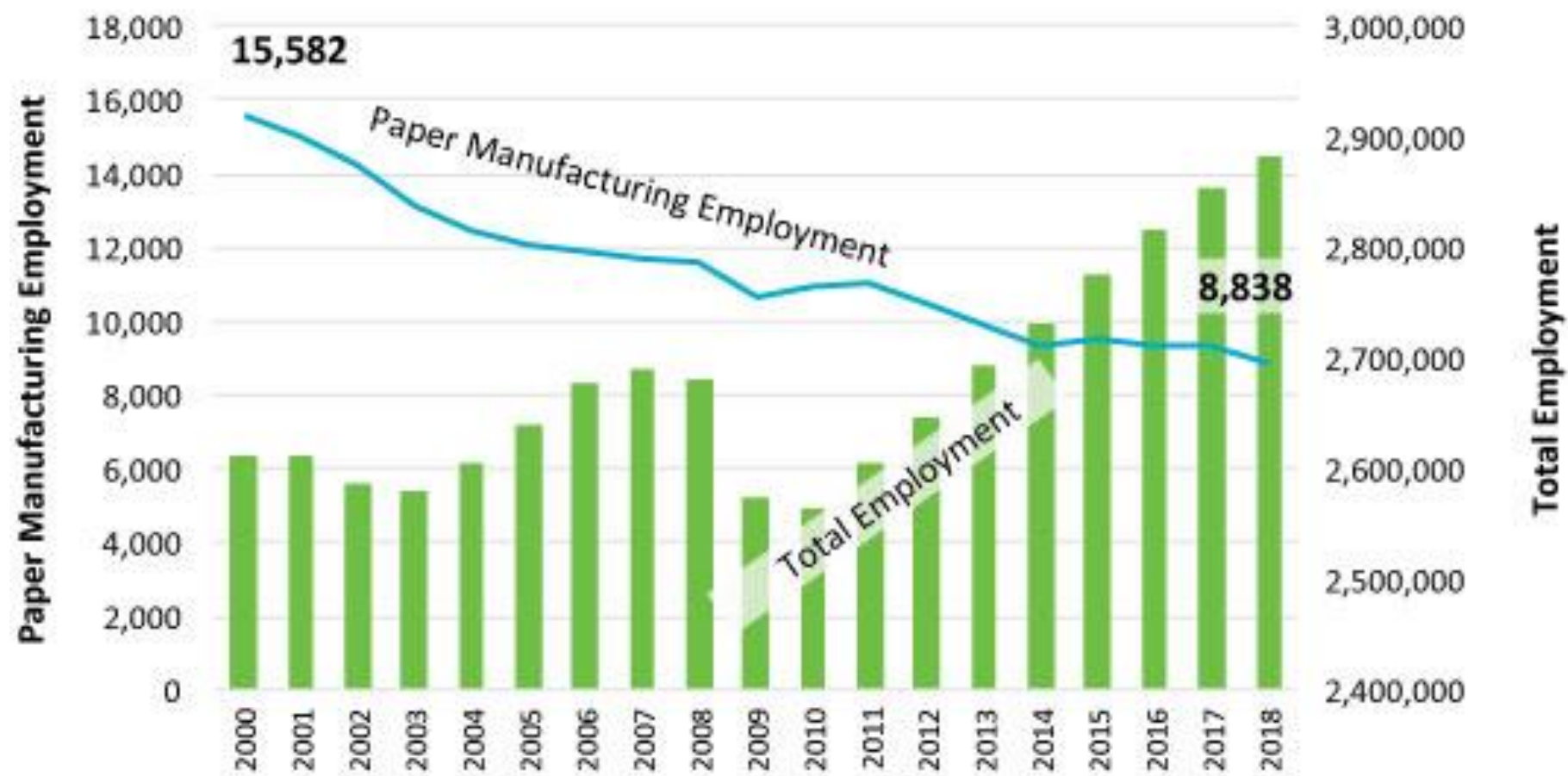
Maplewood

Mendota

Mendota Heights

West Saint Paul

Minnesota Employment Trends

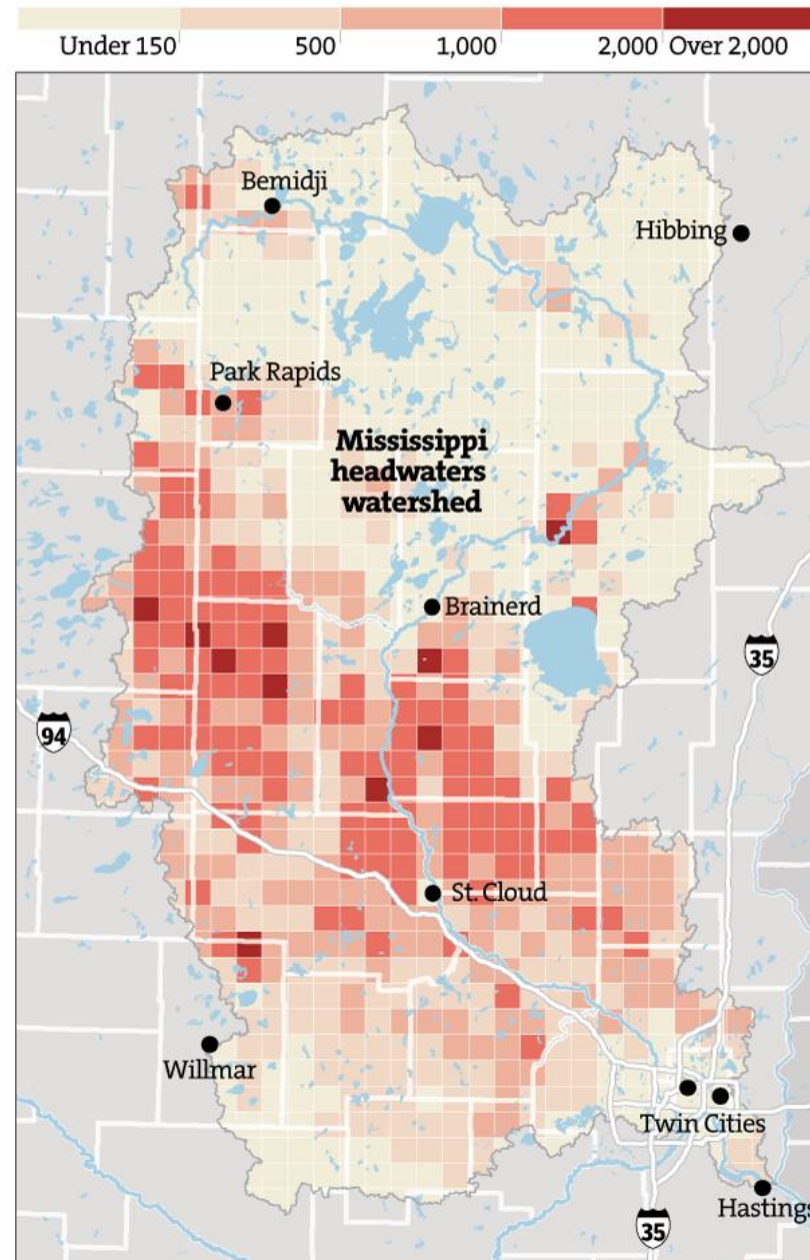


Source: DEED Quarterly Census of Employment and Wages





**Natural land converted to agriculture,
2006-13, in acres per 25 square miles**



Sources: ESRI, USDA Cropland Data Layer, University of Minnesota;
Institute on the Environment

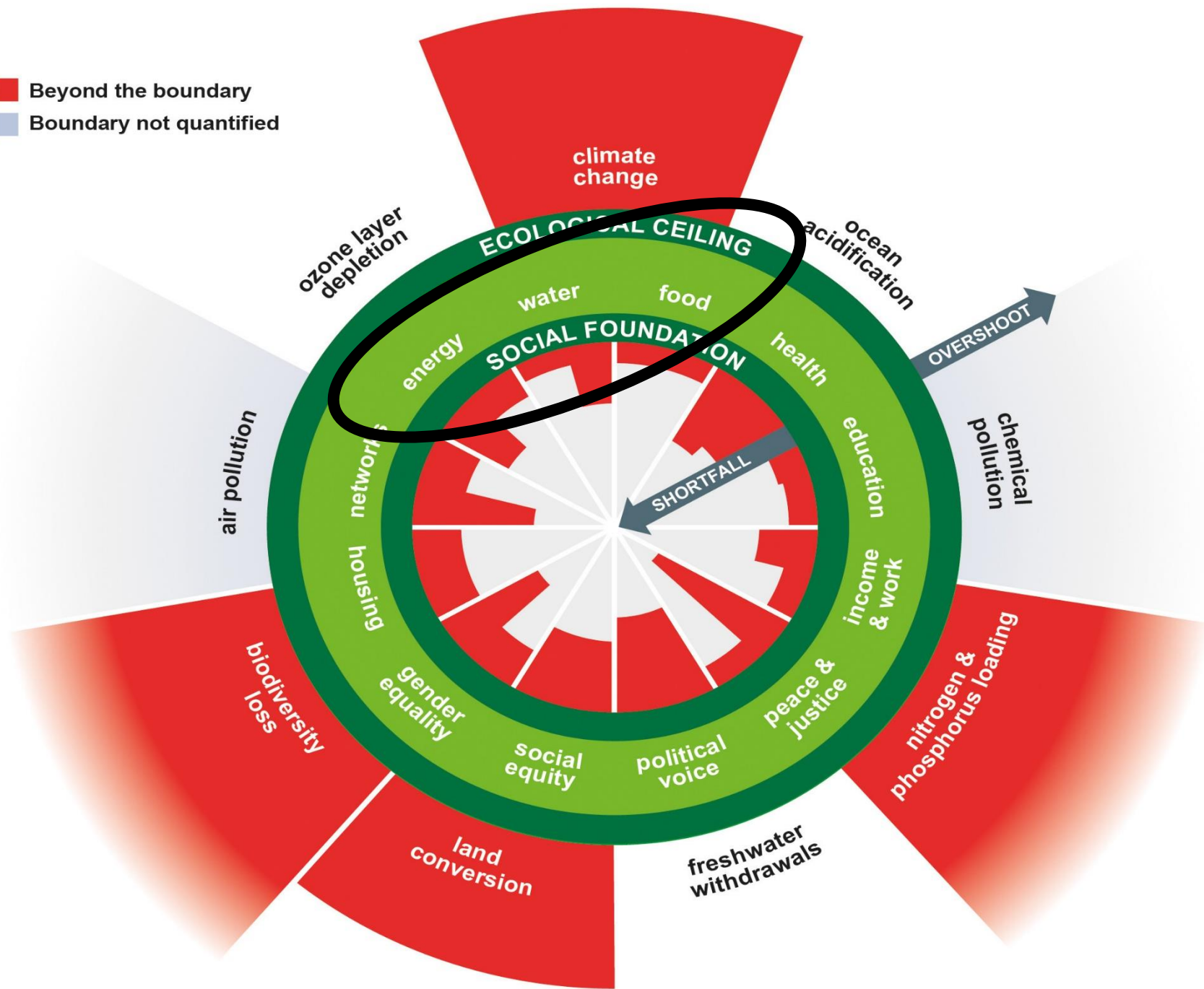
RAY GRUMNEY • Star Tribune

How Cities Can Foster Innovation and Make Markets

Future Needs



- Beyond the boundary
- Boundary not quantified



How Cities Can Foster Innovation and Make Markets

Energy



“Coal is going away... it’s just a matter of time”

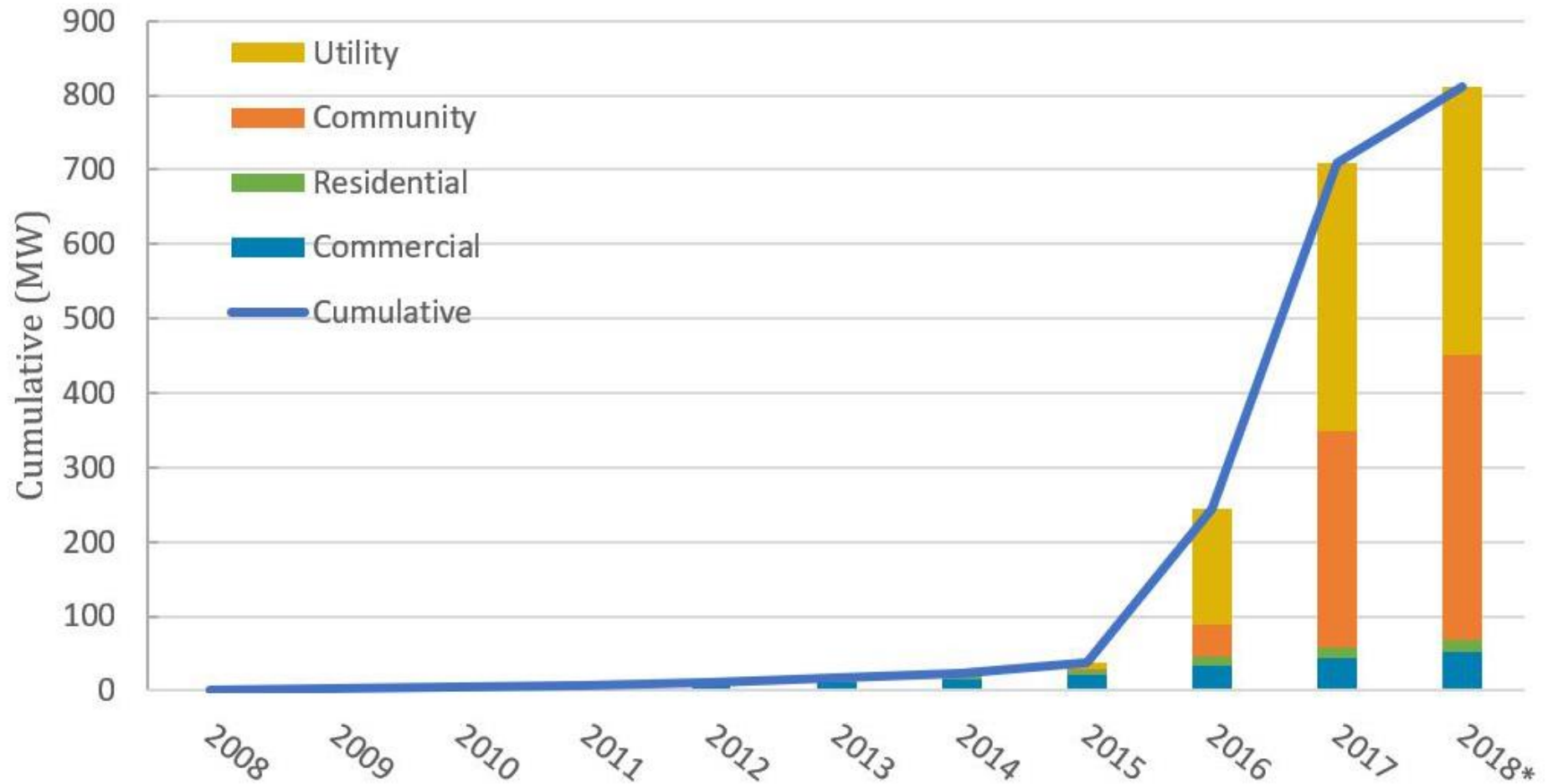
Ben Fowke
CEO, Xcel Energy
January 2014





Minnesota's Solar Capacity

*through July 16, 2018





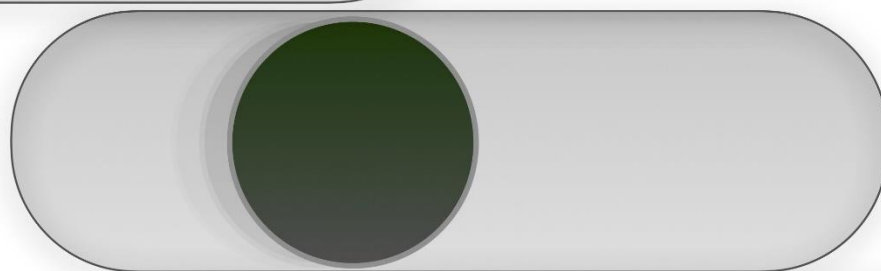


An acre devoted to producing solar electricity yields how much energy annually compared to the same acre devoted to growing corn for ethanol production?

- A. 19% less**
- B. The same amount**
- C. 190% more**
- D. 1,900% more**

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1391

Bee
Safe
Yard

70%



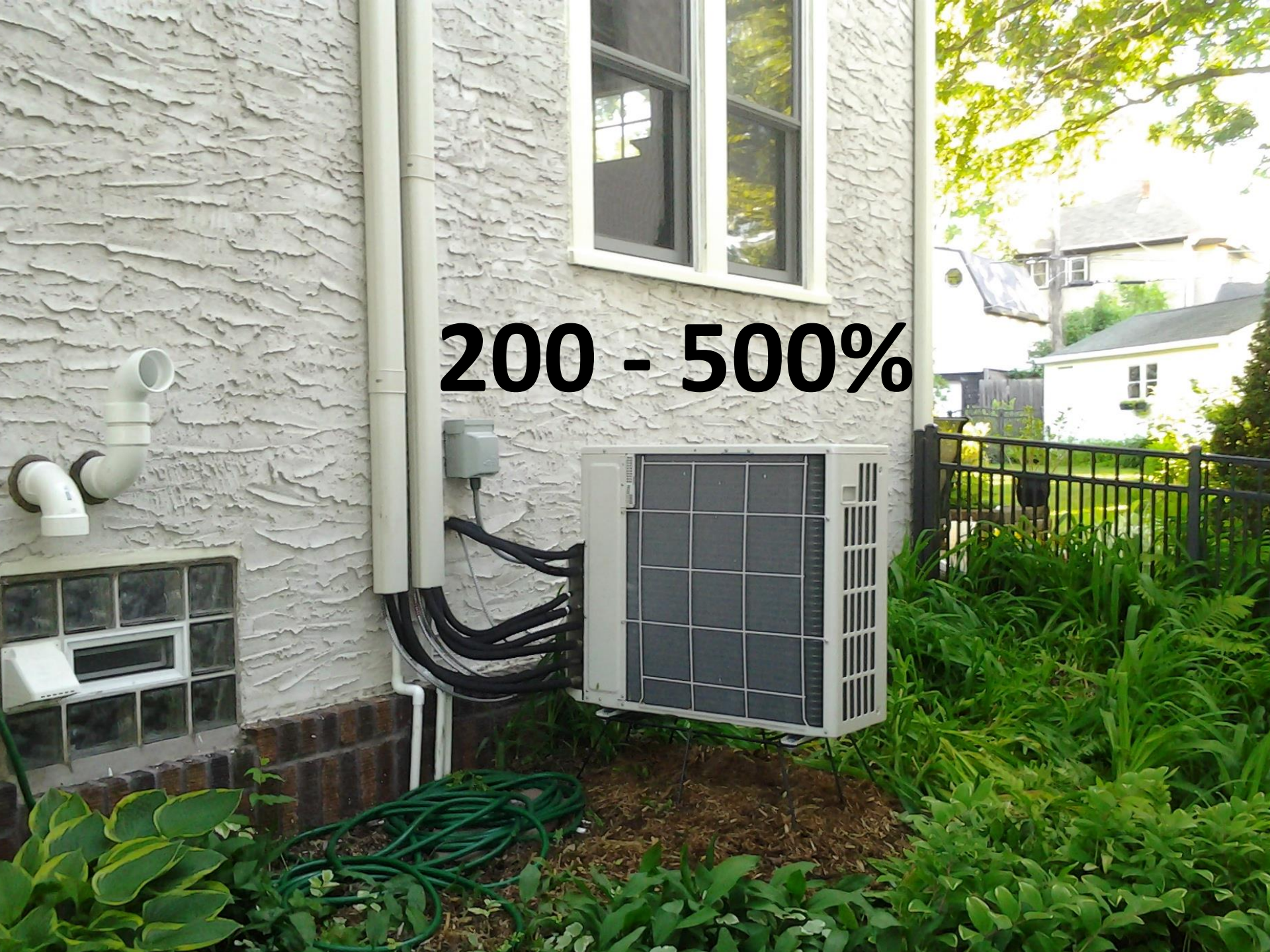
300%



95%



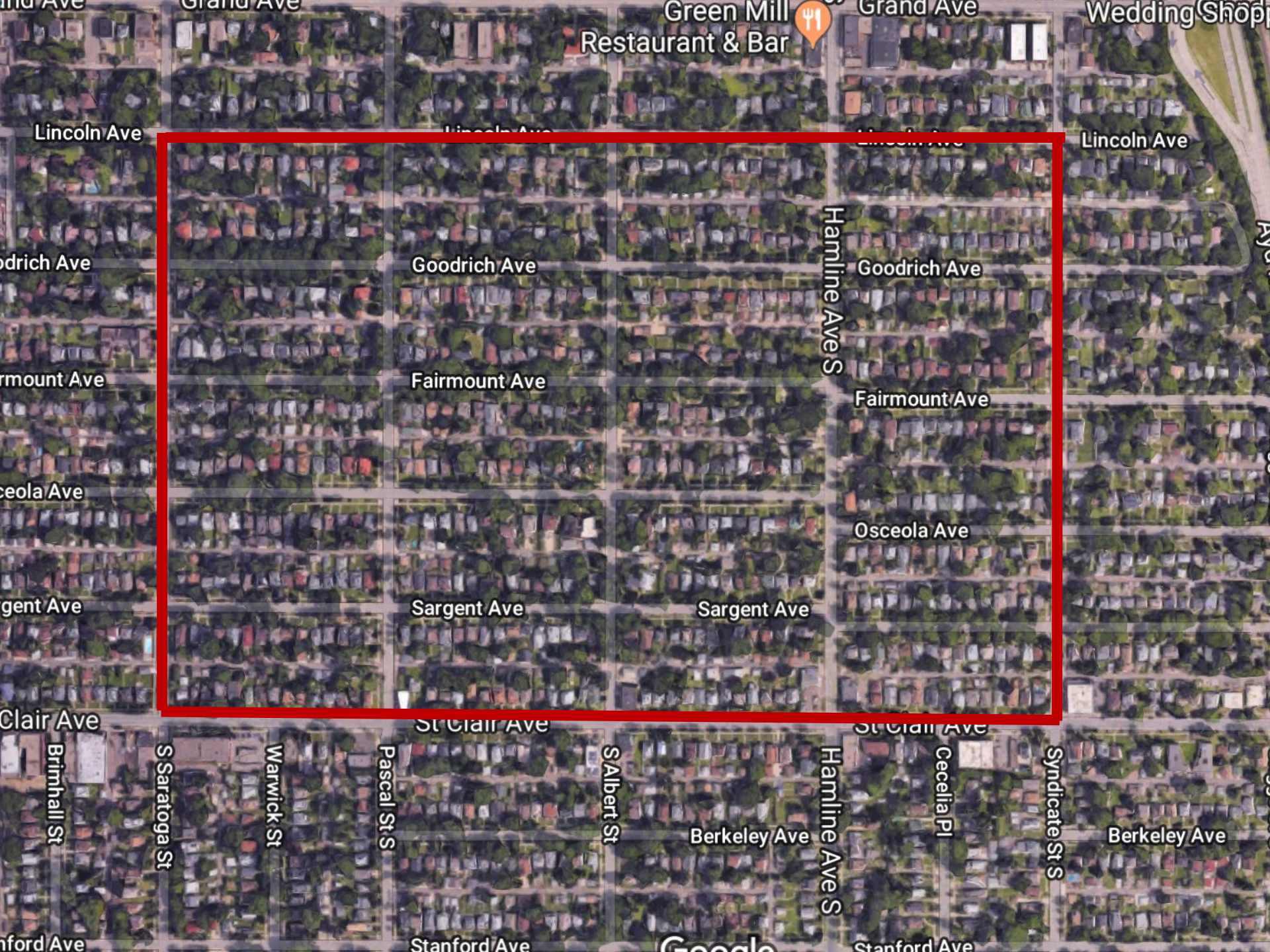
200 - 500%





120

Mississippi River
Visitor Center



Green Mill
Restaurant & Bar



Wedding Shop

Lincoln Ave

Lincoln Ave

Lincoln Ave

Lincoln Ave

Goodrich Ave

Goodrich Ave

Goodrich Ave

Fairmount Ave

Fairmount Ave

Fairmount Ave

Osceola Ave

Osceola Ave

Sargent Ave

Sargent Ave

Sargent Ave

St Clair Ave

St Clair Ave

St Clair Ave

Brimhall St

S Saratoga St

Warwick St

Pascal St S

S Albert St

Hamline Ave S

Cecelia Pl

Syndicate St S

Stanford Ave

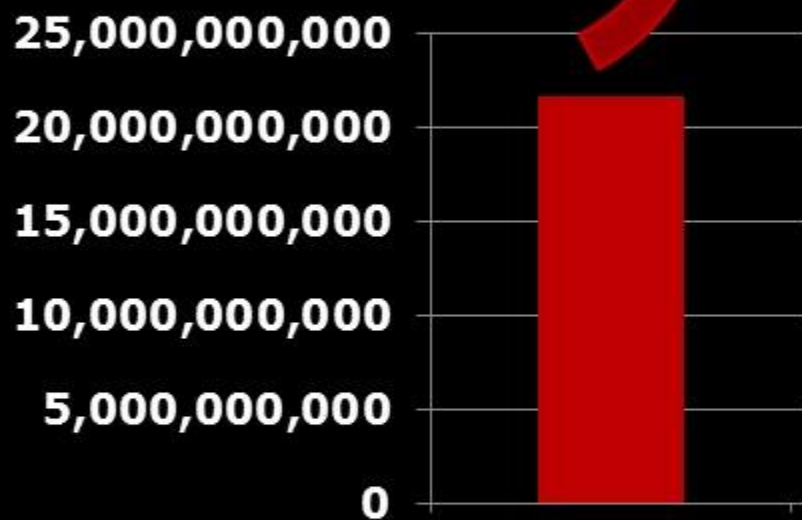
Stanford Ave

Stanford Ave

Berkeley Ave

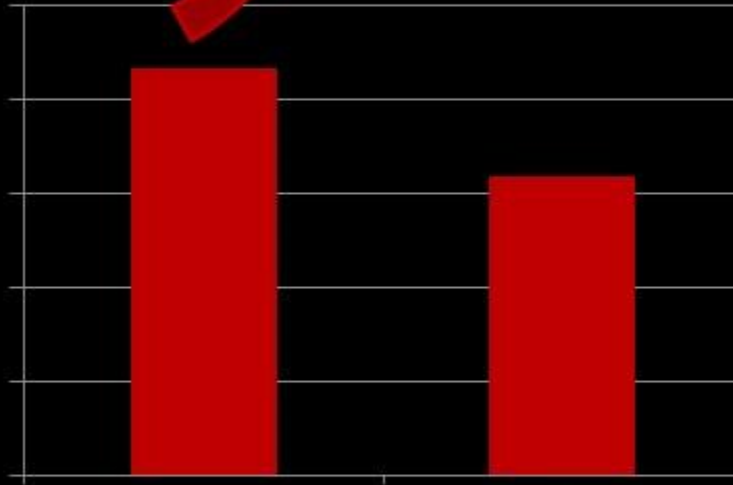
Google

BTUs



BTUs

25,000,000,000
20,000,000,000
15,000,000,000
10,000,000,000
5,000,000,000
0





\$900,000 investment

\$900,000 investment

\$293,000 annual savings



- factory workers,





- factory workers,
- truck drivers,

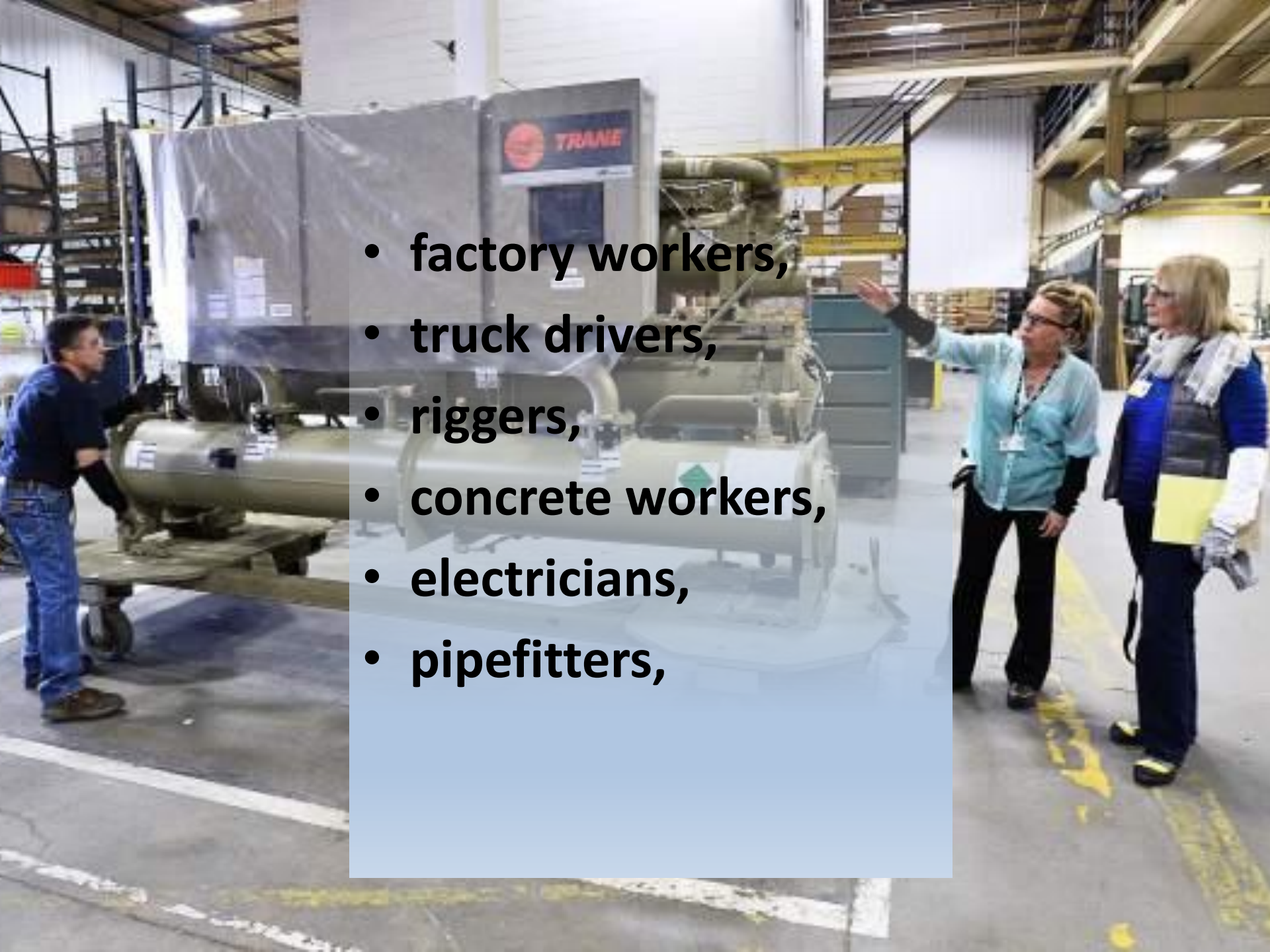


- factory workers,
- truck drivers,
- riggers,



- 
- **factory workers,**
 - **truck drivers,**
 - **riggers,**
 - **concrete workers,**

- 
- factory workers,
 - truck drivers,
 - riggers,
 - concrete workers,
 - electricians,



- factory workers,
- truck drivers,
- riggers,
- concrete workers,
- electricians,
- pipefitters,



- **factory workers,**
- **truck drivers,**
- **riggers,**
- **concrete workers,**
- **electricians,**
- **pipefitters,**
- **software technicians,**



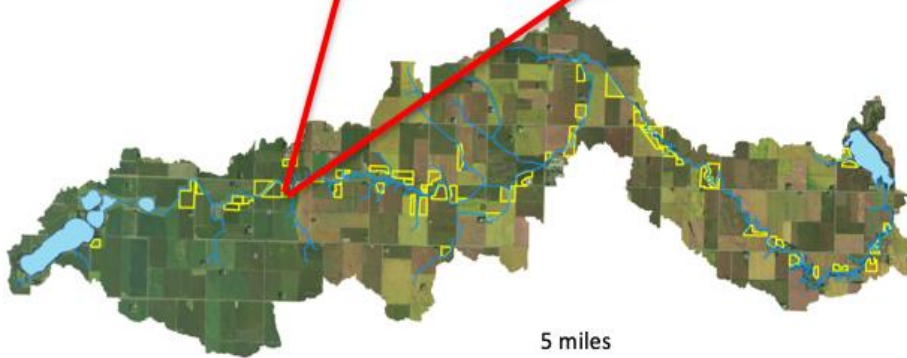
- **factory workers,**
- **truck drivers,**
- **riggers,**
- **concrete workers,**
- **electricians,**
- **pipefitters,**
- **software technicians,**
- **and many others....**

How Cities Can Foster Innovation and Make Markets

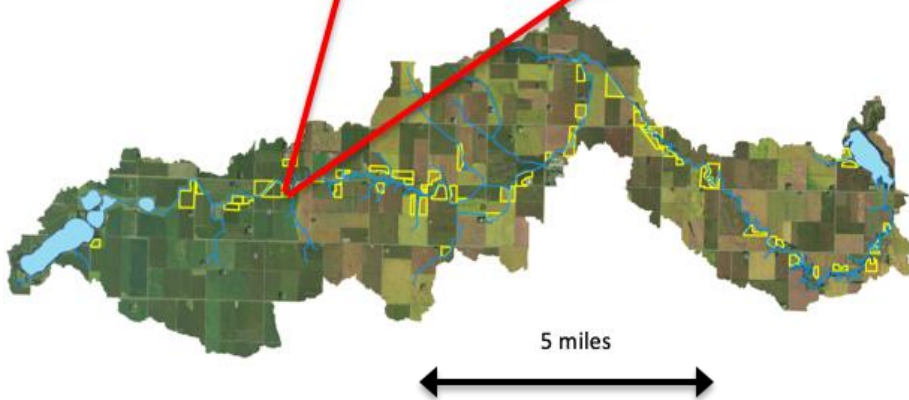
Water



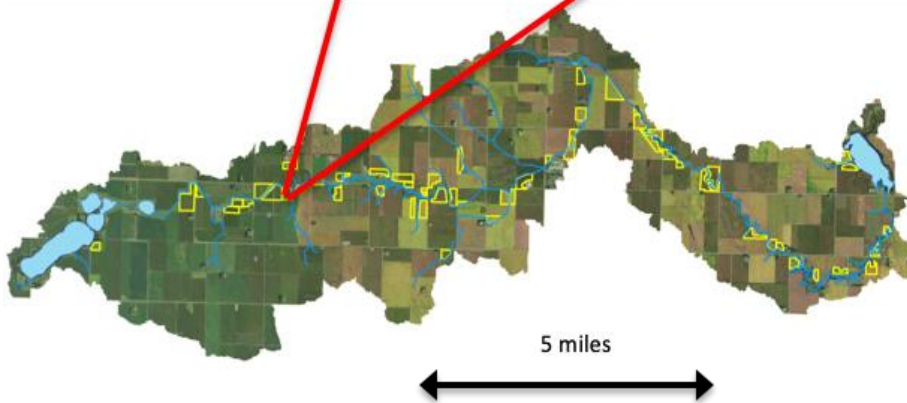




0.5 to 1.0% more \$

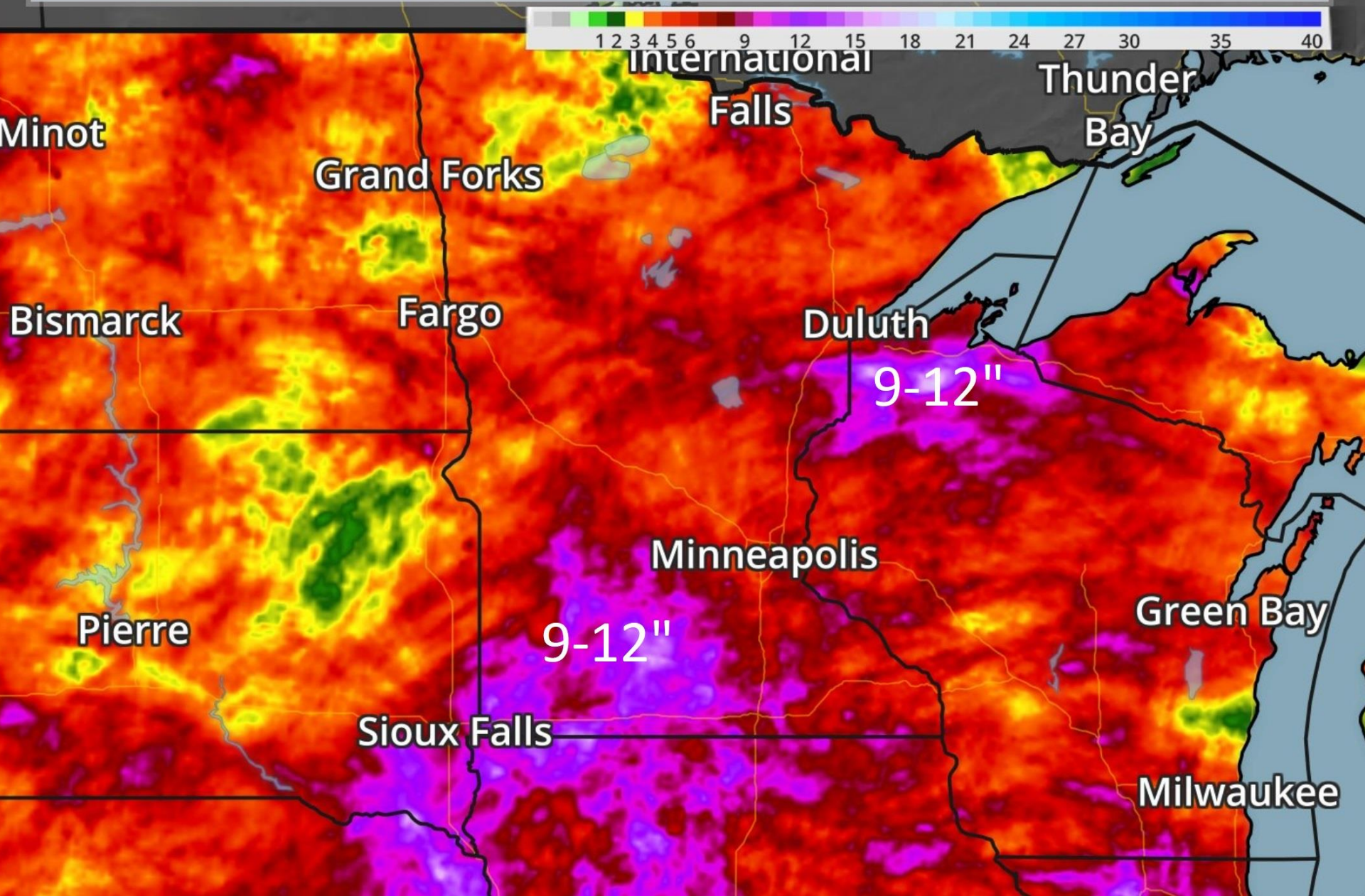


0.5 to 1.0% more \$



**60% water
quality gains**

PAST 30 DAY PRECIPITATION









How Cities Can Foster Innovation and Make Markets

Food





Sept

Dec

March

June

12 mos

21 mos

1 m

2 m

Annual wheat (on left in each panel) and Perennial wheatgrass






Perennial
PANTRY™

a new
flavor-
packed
staple is in
the pantry

Kernza®
FLOUR



HELP SAVE THE PLANET

perennial plants
live year-
round and are
better for the
environment
and farmers

Forever Green





Berries

Natural Products



Camelina

Pennycress

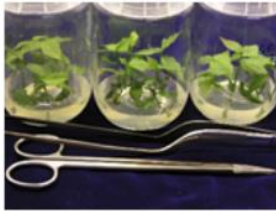


Cover Crops

Silphium

Flax

Summer Annual Grains



Grasslands

Sunflower

Hazelnut

Winter Barley



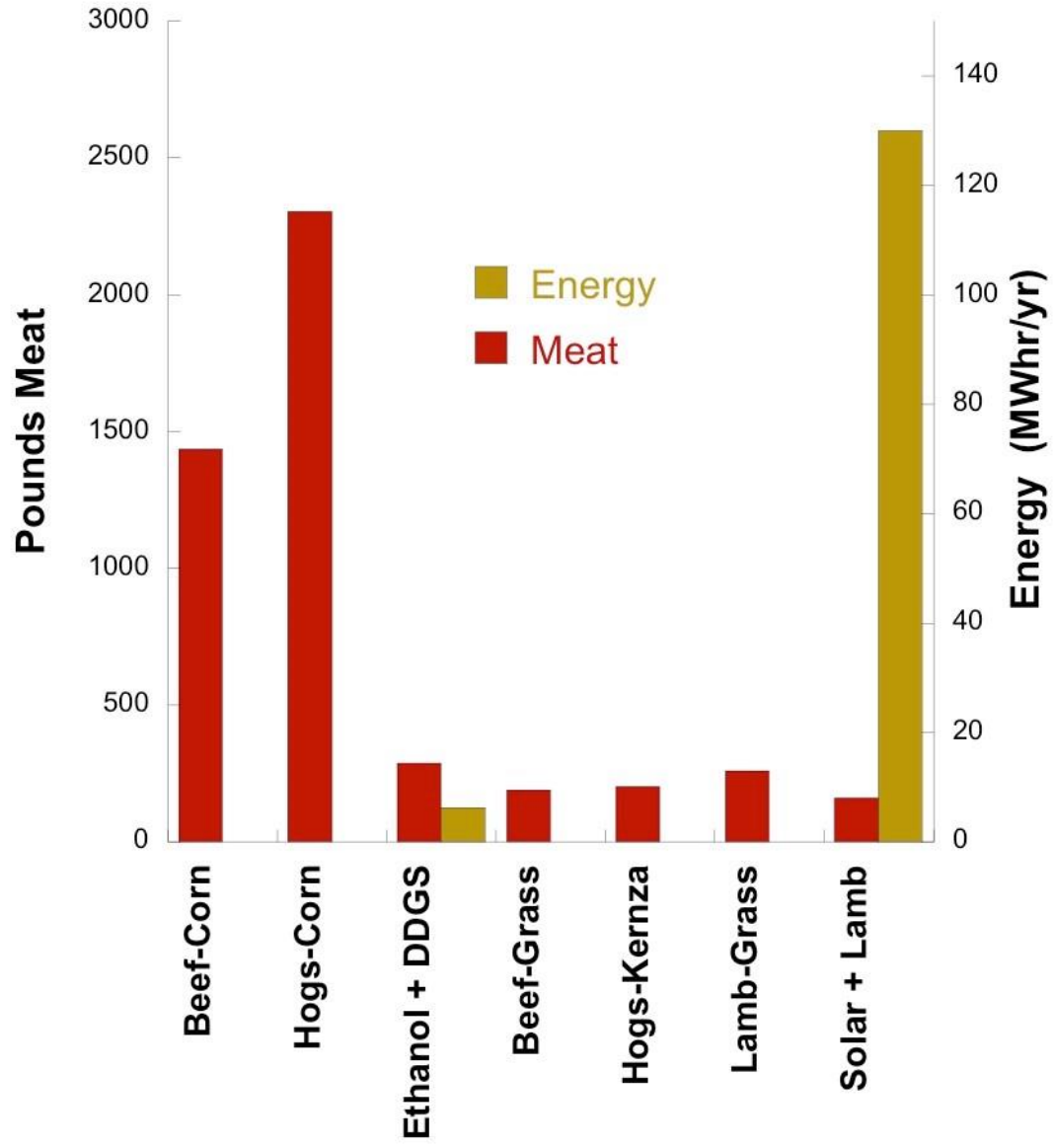
Intermediate Wheatgrass

Woody Perennials











Thank You



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