

NWI
205
*connected
renewed
united
vibrant*



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2050 Plan | influences + futures

Regional assets

Lake Michigan

What kind of asset is this?



The 45-mile stretch of the Lake Michigan shoreline makes up the northern border of Northwest Indiana. Lake Michigan is the second largest of the Great Lakes and is one of the greatest

natural assets and geographical features of Northwest Indiana.

Why is this asset important?

The important qualities of Lake Michigan are endless. Lake Michigan is a plentiful source of fresh water available for industry, transportation of goods and services, commercial opportunities for shipping access, and as a drinking water supply. Lake Michigan provides ample recreational opportunities with pristine beaches, several parks, communities and marinas

lining the shoreline providing direct access to the lake. These opportunities further support the regional economy while also conserving the natural beauty of the lake.

What is the impact to Northwestern Indiana?









Lake Michigan is a true gem and natural treasure for the region that is rarely found in other regions. It provides a delight of activities for residents and visitors alike. There are at least 22 locations to access the lake. Lake Michigan provides food, fishing, recreation, transportation and fresh water supply for drinking, industry and agricultural purposes. Lake Michigan is an

influential driver for the location, growth and prosperity of the region.

Is data / analysis needed to understand this?

- # of visitors
- Water quality data
- Air quality data

Overview of impact:

				
	High	High	High	High
	Medium	Medium	High	High
	Medium	Medium	Medium	Medium
	Medium	Medium	Medium	Medium

Indiana Dunes

What kind of asset is this?



▲
 The Indiana Dunes National Lakeshore is one of the region's and the state's most beautiful natural resource. The Indiana Dunes are a true delight with years of history.

Why is this asset important?

According to the Indiana Dunes National Lakeshore, nearly 2 million guests visit annually. There are roughly 15,000 acres of dunes, oak savannas, swamps, bogs, marshes, prairies, rivers and forests. The Dunes offer a wide variety of year-round activities, including camping, 15 miles of beaches, 50 miles of unique hiking trails, historic sites, wildlife, horseback riding trails

and an abundance of natural splendor. The Dunes is also known for its world class birding and over 1,100 native plant species.

What is the impact to Northwestern Indiana?









The Dunes beauty and diversity are enjoyed by both residents and visitors alike. There are numerous educational opportunities, programs, guided tours and geocaching to help inform the importance in caring and maintaining this natural wonder. The Indiana Dunes National Lakeshore is in transition to be a National Park. Designating the dunes as a national park

would give the area the recognition it deserves, attracting more visitors, increasing quality of life and help further grow the economy in Northwest Indiana. The Dunes would become the 61st national park, and the first in Indiana.

Is data / analysis needed to understand this?

- # of visitors
- # of visitors after National Park designation and percent change

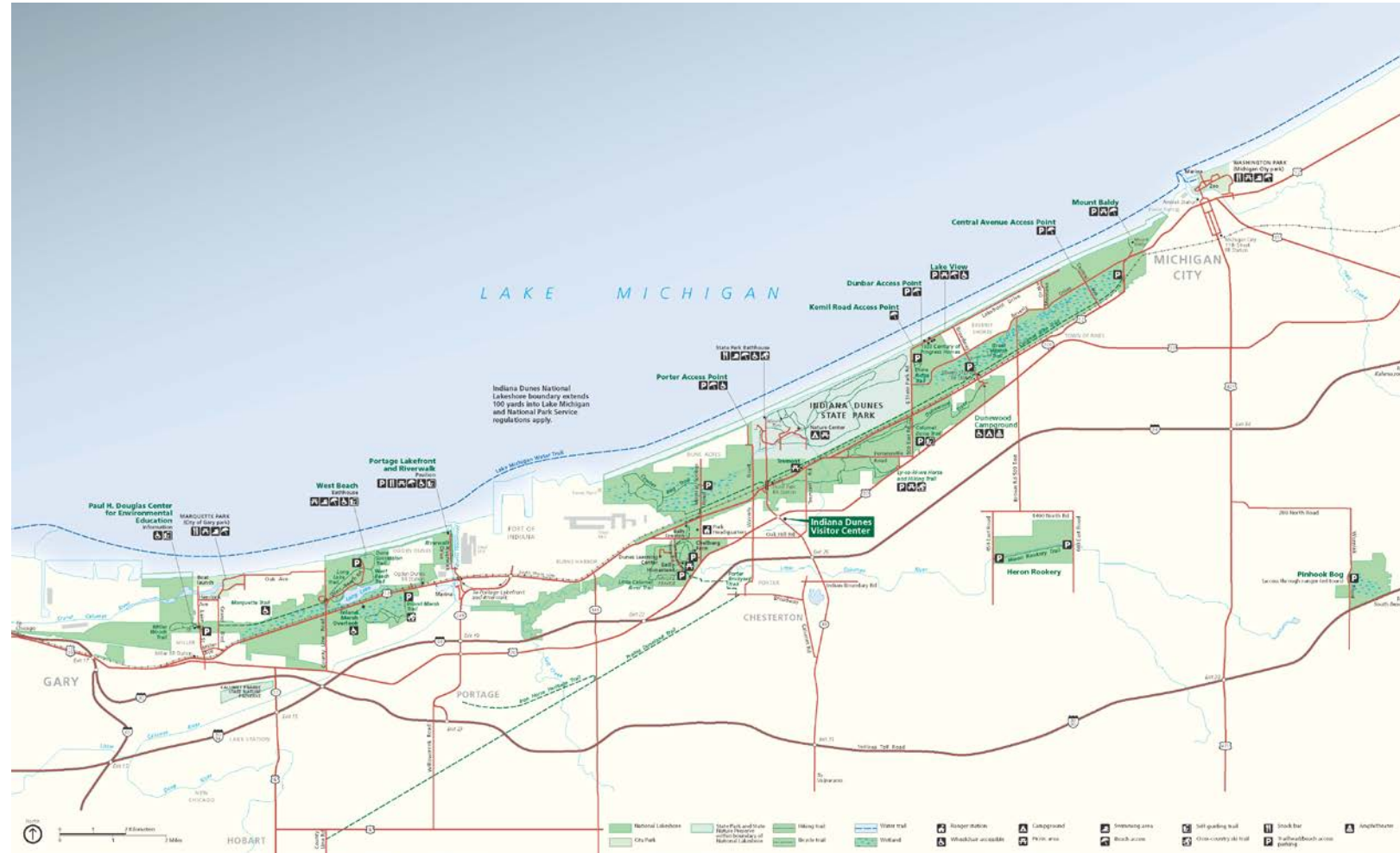
Overview of impact:

				
	High	High	High	High
	High	High	Low	Medium
	Low	Unknown	Unknown	Medium
	Medium	Medium	Unknown	Medium

Want to know more about
 Indiana Dunes



Source: NIRPC Photo



Source: Map Courtesy of IDNL

Geological / ecological

What kind of asset is this?



Northwest Indiana is renowned for its rich environmental diversity and unique ecosystem that is unlike other regions.

Why is this asset important?

Northwest Indiana has a unique biodiversity, rich ecosystem, and diverse climate. According to the Indiana Dunes National Lakeshore, biological diversity is amongst the highest per unit area of all national parks. Over 1,100 flowering plant species and ferns make their homes here. From predacious bog plants to native prairie grasses and from towering white pines to rare algal species, the plant diversity is rich. Wildlife habitat and

world class birding, with more than 350 species can also be found in the region. The region also has a rich and fertile soil ideal for farming. While much of the built environment is found near the Lake, development trends have been moving further south into prime agricultural lands. There are numerous organizations working to protect and restore significant ecological natural areas and to support agriculture in the region.

What is the impact to Northwestern Indiana?

The natural environment and all it provides is an important natural aspect to the region. The rich agricultural lands provide food and resources. With the region predominately flat land, infrastructure has typically been easy to build. As a result of human activity and the built environment, much of the ecosystems have been greatly impacted, fragmented and under

constant diverse stress. Protection and restoration of the ecosystem functions and prime agricultural lands are vital in maintaining the long-term viability of these assets and resources.

Is data / analysis needed to understand this?

- % of prime agricultural land
- Map of agricultural land
- Map of biodiversity/environmental features
- % of managed lands
- Acres of managed lands

Overview of impact:

	High	High	High	High
	Medium	Medium	Unknown	Low
	Unknown	Unknown	Unknown	Unknown
	Medium	Medium	Medium	Medium

Want to know more about
Geological Ecological



Source: NIRPC Photo



Source: NIRPC Photo

Proximity to Chicago

What kind of asset is this?



One of Northwest Indiana's most advantageous feature is its close proximity to the City of Chicago and the metropolitan scale of elements to benefit from.

Why is this asset important?

The ideal location and closeness to Chicago provides the balance of big city, with small town and natural amenities to foster and enjoy. Chicago is the third largest city in America and an economic "water" shed of business. The close proximity to major markets and a strong international economic center is healthy for the region. NWI has numerous options in reaching

the City, including the South Shore Line, which provides easy and direct access to amenities, jobs, services and entertainment opportunities. NWI is fortunate to be in close proximity to an economic and metropolitan city, with plentiful services, resources, banking, hospitals, and major international airports.









What is the impact to Northwestern Indiana?

Depending on the location, most residents can drive to Chicago in less than one hour with the closest point a mere 19-minute drive to Chicago's downtown. There are various transportation options to access Chicago's cultural, educational, and employment opportunities.

Is data / analysis needed to understand this?

- % of commuters to Chicago
- Commuting patterns and data
- Number of NWI residents who work in Chicago
- Tourism synergy from Chicago
- Impacts on economy data

Overview of impact:

				
	Low	Unknown	Low	Medium
	High	Medium	High	High
	Medium	Medium	High	High
	High	High	High	High

Want to know more about
 Proximity to Chicago



Source: South Shore Line



Source: NIRPC Photo

Existing infrastructure

What kind of asset is this?



Northwest Indiana's existing infrastructure and numerous transportation networks play a key role in supporting and enhancing the region's economic and quality of life.

Why is this asset important?

Situated along the crossroads of America, Northwest Indiana offers a comprehensive mix of transportation and infrastructure to move people and goods. The area is served by four US interstates; commuter rail systems such as NICTD South Shore Line and Amtrak; Class 1 freight railroads; local public transit buses; the Port of Indiana-Burns Harbor; the Gary-Chicago

International Airport; and nearly 160 miles of trails, greenways and pedestrian ways.

What is the impact to Northwestern Indiana?

The interstates and highways in the region are one of the most traveled, providing vital connections within the region and throughout the Midwest with ample opportunities for businesses and services. The South Shore Line provides an important transportation link that connects Northwest Indiana to Chicago with future projects, such as the Double Track and West Lake Corridor to better reach destinations in a timely manner. Transit

is an important travel choice and needs to be maintained and expanded for future opportunities. Key to a successful transportation network is connecting all modes to one another. The Port of Indiana has year-round access via the St. Lawrence Seaway to provide shipping and commodities opportunities. The Gary/Chicago Airport has the ability to meet its full potential.

Is data / analysis needed to understand this?

- Condition of roadways
- Utilization
- Congestion
- # of transit riders on South Shore Line
- # of transit riders (Buses)
- Data regarding cargo freight, rail, and port
- Mileage of each networks of transportation infrastructure

Overview of impact:

<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	Low	Medium	Low	Low
	High	Medium	Medium	Medium
	High	Medium	Medium	Medium
	High	High	High	High

*Want to know more about
Existing Infrastructure*



Source: NIRPC Photo



Source: NIRPC Photo

People & culture

What kind of asset is this?



The character of Northwest Indiana is established through its people and culture.

Why is this asset important?

Northwest Indiana celebrates its diversity through a variety of ethnic, cultural, art and human capital elements. The region offers several options to experience art, culture and architecture. Ranging from renowned art galleries to historic landmarks rich with history drawing residents and visitors equally. Human capital provides the region some of its most vital services through a number of hospitals, urgent care facilities, clinics, and

private practices. The region is home to abundant educational services, programs and Colleges and Universities. These include public, private, charter elementary and high schools, along with recognized institutions as Valparaiso University, Purdue University Northwest, Indiana University Northwest, Ivy Tech, and Calumet College of St. Joseph.









What is the impact to Northwestern Indiana?

Arts and Culture are quickly becoming a regional asset that is drawing tourism and displaying the region's rich culture, recreational and natural features. A growing number of downtown's are focusing on arts districts to help revitalize and create vibrant downtown centers. With such a rich diversity and complexity, the region's quality of life is full of flavor.

Is data / analysis needed to understand this?

- % of degrees (higher education, etc)
- Educational attainment data
- Population breakdown (race)
- Recreational access
- # arts related businesses
- Healthcare indicators
- Music and entertainment data

Overview of impact:

				
	Medium	Medium	Medium	Medium
	Medium	Medium	Medium	High
	Medium	High	Medium	Medium
	Medium	Medium	Medium	Medium

Want to know more about
People & Culture



Source: NIRPC Photo



Source: NIRPC Photo

Economic & business climate

What kind of asset is this?



Northwest Indiana is the state's second largest economy with prevailing strengths and growth opportunities.

Why is this asset important?

With its strategic location along the south shore of Lake Michigan, the steel industry and manufacturing has played an important role in the economy. The region is also home to a diverse set of businesses that have capitalized on the area's assets, transportation infrastructure, recognized business climate, and a talented and competitively-priced labor pool.

What is the impact to Northwestern Indiana?

Indiana ranks ninth (9th) in best tax environment in US based on 2018 State Business Tax Index by Tax Foundation. This provides an incentive for innovative business and economic growth. The region has the opportunity to expand and diversify its workforce and economic sectors to meet the demands of emerging markets. As a result of low cost of living and high

Northwest Indiana offers a friendly business climate with low-cost of living, low taxes and high quality of life.

quality of life features, such as appealing recreation and lifestyle opportunities, a great number of people are taking advantage of these features and moving into the region.

Is data / analysis needed to understand this?

- % Employed in Sectors/Workplace breakdown
- Missing sectors
- Per Capita Personal Income
- % Labor force and employment
- Recreational access
- Food desert data
- Low Income Low Access
- # of tourism/tourists (breakdown)
- Philanthropy impact, data and measures

Overview of impact:

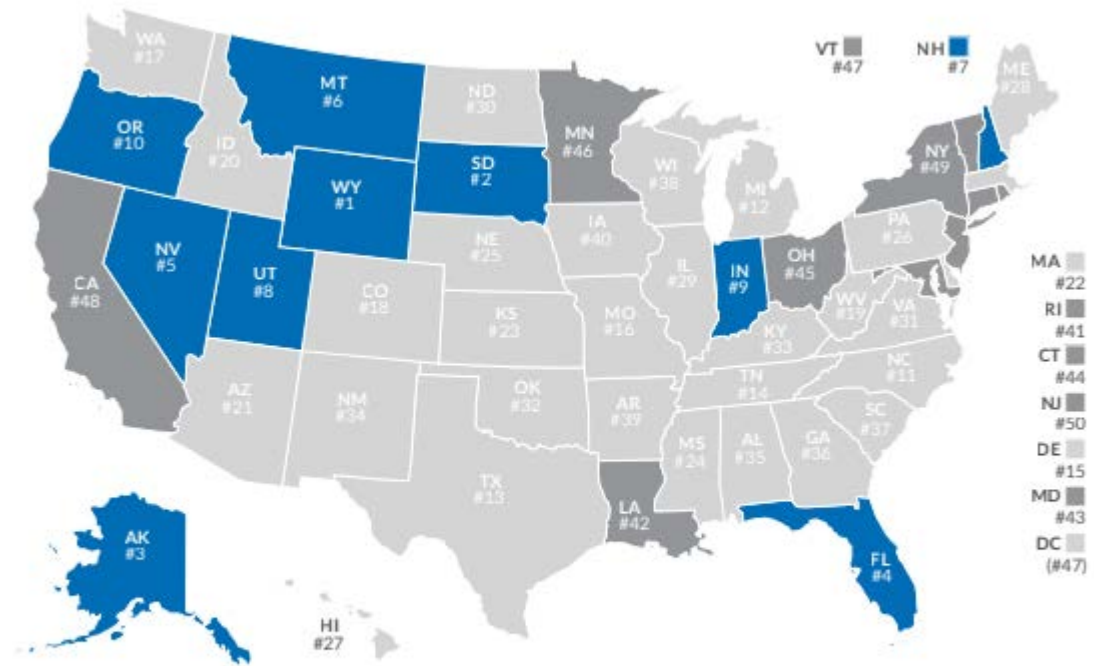
	Low	Medium	Low	Medium
	High	High	High	High
	Medium	High	High	High
	High	High	High	High

*Want to know more about
 Economic & Business Climate*

2018 State Business Tax Climate Index Ranks and Component Tax Ranks

	Overall Rank	Corporate Tax Rank	Individual Income Tax Rank	Sales Tax Rank	Unemployment Insurance Tax Rank	Property Tax Rank
Alabama	35	22	22	49	11	12
Alaska	3	26	1	5	25	38
Arizona	21	13	18	47	15	6
Arkansas	39	39	30	44	32	22
California	48	32	50	41	13	13
Colorado	18	18	15	39	35	14
Connecticut	44	31	37	27	19	49
Delaware	15	50	34	1	3	20
Florida	4	19	1	29	2	10
Georgia	36	10	42	28	38	23
Hawaii	27	14	31	23	27	16
Idaho	20	25	23	26	46	3
Illinois	29	36	16	35	42	45
Indiana	9	23	10	9	10	4
Iowa	40	48	33	19	34	39

2018 State Business Tax Climate Index



Note: A rank of 1 is best, 50 is worst. Rankings do not average to the total. States without a tax rank equally as 1. DC's score and rank do not affect other states. The report shows tax systems as of July 1, 2017 (the beginning of Fiscal Year 2018).

Source: Tax Foundation.



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Environment

New energy sources (wind)

Why is this important?

There have been rapid advancements in wind energy technologies in recent years. At present, wind energy provides approximately 2% of the global electrical demand, while nuclear power covers 13%, but if the growth continues at the present rate wind energy may cover a sixth of the global electrical energy demand a decade from now. Yet, regardless of recent developments and technologies, there are still countless

uncertainties in the energy industry regarding wind: (1) What is the global capacity for energy production by the wind? (2) Will the added turbulence and reduced wind speeds generated by massive wind farms cool or heat the surface? (3) Can wind farms affect precipitation? Life-cycle analysis studies show how wind energy can reduce the atmospheric emission of eight air pollutants and how the generation of noise impacts humans.

When might this make impact?



Wind energy has seen major advancements in recent years, yet it is still far from dominating the energy industry. It is realistic to assume that in the future, wind could be the leader in energy production, however, there are several hurdles pushing that potential future further away. Politics and a reduction in the cost

of commercial fracking has shifted the focus from wind. And public perception will always be a constant battle. On the other hand, wind energy is trending in recent years and has seen an influx in development across the world. This influx is mainly due in part to massive strides in efficiency and reduction in cost.

How might this impact Northwestern Indiana?

The levelized cost of energy (LCOE) for new onshore wind farms is typically 0.06–0.14 USD kWh⁻¹, while for offshore it is 0.14–0.19 USD kWh⁻¹. Despite the lower cost of onshore wind farming, several countries, most notably the UK, Germany and Denmark, invest heavily in offshore wind farms and 10% of all new installations in the EU are now offshore.

Given this trend in Europe, it is likely the U.S. will follow. At the southern tip of Lake Michigan, Northwest Indiana is in an ideal situation for offshore wind farming in the American Midwest. Although, wind turbines making a splash in Lake Michigan is unlikely, given the uncertainty regarding the possible environmental effects below the water surface.

Is data / analysis needed to understand this?

- Impacts of offshore wind farm construction/installation on marine life
- Effects of wind farms on precipitation and ground surface temperatures
- Threat to bird populations/migrations
- Cost-benefit analysis of both on and offshore wind farming

- Effects of wind farming on atmospheric circulation and exchange of gases

Overview of potential impact:

<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	Low	High	Low	High
	Low	Medium	Low	Medium
	Unknown	Unknown	Low	Medium
	Low	Low	Unknown	Low

Want to know more about
Wind Energy



Source: <https://secure.flickr.com/photos/nhd-info/8033151828/sizes/l/>



Source: Darrell Homemann/ Midwest Center for Investigative Reporting

Increased water demand

Why is this important?

By 2020 about 30-40% of the world will have water scarcity, and according to the researchers, climate change can make this even worse. There will be about 1 billion more mouths to feed worldwide by 2025 and global agriculture alone will require another 1 trillion cubic meters of water per year (equal to the annual flow of 20 Niles or 100 Colorado Rivers). With only 7% of the world's freshwater, China plans to produce 807 million

gallons a day from desalination by 2020, roughly quadruple the country's current capacity. Water demand in India will reach 1.5 trillion cubic meters in 2030 while India's current water supply is only 740 billion cubic meters. By the year 2040 there will not be enough water in the world to quench the thirst of the world population and keep the current energy and power solutions going if we continue doing what we are doing today.

When might this make impact?

- Existing
- Trending
- Emerging
- Speculative

Increase in water demand is a silent threat that is constantly growing and is mostly unnoticed. Water is largely impacted by major drivers which include: (1) climate change, (2) rapid urbanization, (3) increasing consumption, and (4) demand for food and energy. These drivers are inevitable due to population

growth and that they are embedded culturally in society. The demand for water and sanitation services is greater than it has ever been, and will only rise as the world's population grows by an estimated 2 billion by 2050. Water demand has been, always will, and is increasing.

How might this impact Northwestern Indiana?









With the immense fresh water resource of Lake Michigan at our back door, Northwest Indiana, being situated at the southern tip of the great lake, will likely not be water-stressed. Instead, on the contrary, the great lakes basin may see massive economic growth from population migrating from water-stressed, southwest regions of the United States. This potential spike in

population would apply immense pressure to our already weakened water infrastructure network.

Is data / analysis needed to understand this?

- Effects of climate change on the Great Lakes
- Cycles of when lake levels rise and recede
- U.S. fresh water availability and future demands
- Effects of water resources or lack thereof on: real estate, land values, and land uses

Overview of potential impact:

				
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	High	High	High	High
	High	High	High	High
	High	High	High	High
	Low	Low	Low	Low

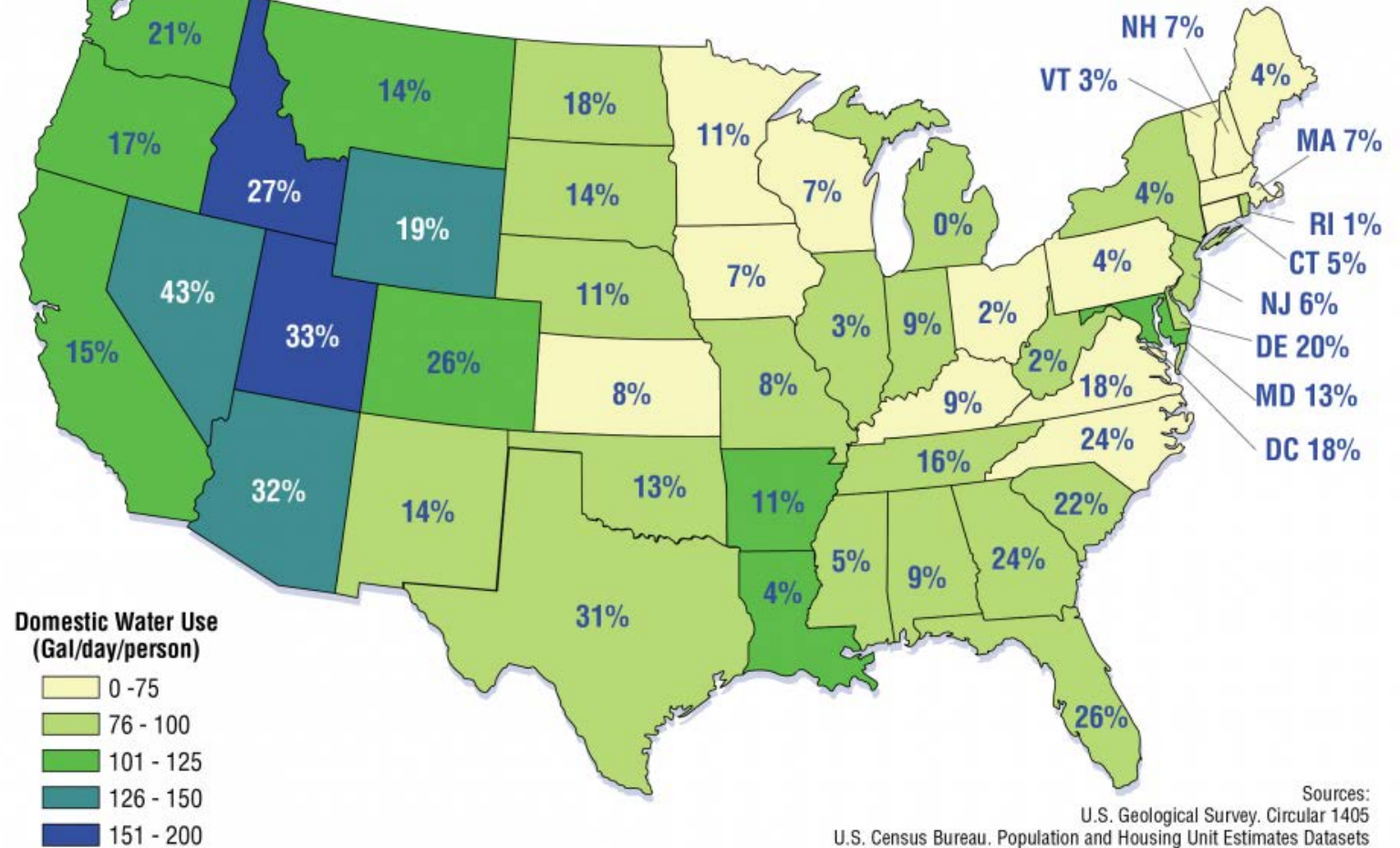
*Want to know more about
 Increased Water Demand*

There are
1 million miles
 of **DRINKING WATER PIPES**
 across the country

Every day nearly
6 Billion Gallons
 of treated water is **LOST**
 due to leaking pipes

\$1 Trillion
IN INVESTMENT IS NEEDED
 to maintain and expand service to
 meet demands over the next
25 years

**Domestic Water Use in Gallons per Day per Person
 and Percent Population Growth from 2000 to 2015**



Sources:
 U.S. Geological Survey, Circular 1405
 U.S. Census Bureau, Population and Housing Unit Estimates Datasets

Extreme weather/climate events

Why is this important?

As the world has warmed, that warming has triggered many other changes to the Earth's climate. Human-induced climate change has already increased the number and strength of some of these extreme events. Over the last 50 years, much of the U.S. has seen increases in prolonged periods of excessively high temperatures, heavy downpours, and in some regions, severe floods and droughts. Flooding may intensify in many U.S. regions, even in areas where total precipitation is projected to

decline. A flood is defined as any high flow, overflow, or inundation by water that causes or threatens damage. Floods are caused or amplified by both weather- and human-related factors. Major weather factors include heavy or prolonged precipitation, snowmelt, thunderstorms, storm surges from hurricanes, and ice or debris jams. Human factors include structural failures of dams and levees, altered drainage, and land-cover alterations (such as pavement).

When might this make impact?

- Existing
- Trending
- Emerging
- Speculative

Worldwide, from 1980 to 2009, floods caused more than 500,000 deaths and affected more than 2.8 billion people. In the United States, floods caused 4,586 deaths from 1959 to 2005 while property and crop damage averaged nearly 8 billion dollars

per year (in 2011 dollars) over 1981 through 2011. The risks from future floods are significant, given expanded development in coastal areas and floodplains, unabated urbanization, land-use changes, and human-induced climate change.

How might this impact Northwestern Indiana?









The Federal Highway Administration launched a climate change resilience pilot program, of which the State of Michigan prepared a Climate Vulnerability Assessment report. MDOT provided key issues of concern within the Climate Analysis portion of the final report. The analysis identifies climate variables of interest based on the impact of recent extreme weather events on the transportation system. Given that our regional ecosystem is more comparable to that of Michigan than our own state, it is

likely NWI will experience similar impacts, including: (1) increased erosion from intense precipitation; (2) seasonal precipitation changes – both amount and type (snow vs. rain); (3) bridge scour; (4) freeze/thaw; (5) Great Lakes ice cover (and impact on lake effect snow) and lake levels; and (6) road buckling. And, as evident by the events in early 2018, flooding will likely be the most pressing challenge in our Region.

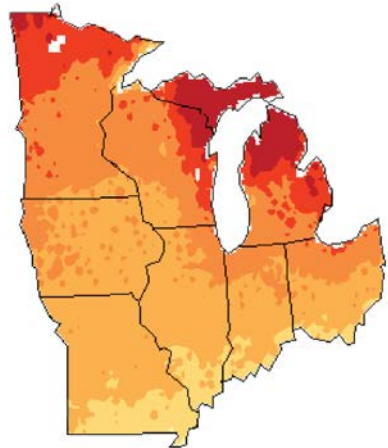
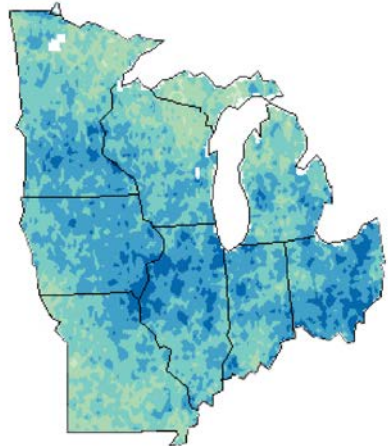
Is data / analysis needed to understand this?

- Average annual increase in precipitation
- Impact of impervious surfaces on urban heat island and storm water management/flooding
- Trends in periods of excessively high temperatures
- Quantified resilience of at-risk infrastructure such as dams, levees, bridges, etc.
- Changes in the frequencies of flood events

Overview of potential impact:

				
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
				
				
				
				

**Want to know more about
 Extreme Weather/Climate Events**



Source: <https://nca2014.globalchange.gov/report/regions/midwest>



Wisconsin St. Bridge (Hobart)



Calumet Ave. (Munster)

Jerry Smith



U.S. 30 – Target (Hobart)



Evans & Silhavy (Valparaiso)

Source: *NWI Times*



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People

The aging population

Why is this important?

The age structure of the population is expected to experience a generational shift over the next four decades. Baby boomers effects are gradually going towards an emergent Millennials generation leadership which will be impacting economy and population.

This implies an abrupt demographic divide between young and older inhabitants caused by factors such as declining fertility rates, health care policies, and longevity. According to the Indiana Business Research Center, this gap between age groups draws a decline in Indiana's traditional working-age population over the next 20 years.

When might this make impact?



Effects on population are estimated based on a regular negative rate during the current decade with tendencies to remain. This is reflected by a population loss of 1 percent during the current

decade. A small raising in the number of residents (2%) is projected for the next decade in Northwest Indiana, but again population loses for the period 2030 to 2050.

How might this impact Northwestern Indiana?

Since the total population growth is being persistently slow, side effects like Baby-boom generation increasing rate is a matter of concern for future decades. Considering that current baby boomers are between the ages of 54 and 72 but the youngest ones will turn 71 in 2035, the 65 years old population will increase from 14.6% in 2015 to 20.7% in 2035 through 2050.

In the meantime, other generations like Millennials and younger generations preserve a slow decreasing rate of total population in the long-range. Some consequences are loss of working-age groups, lower or deficit of work-force supply, and increasing of health care expenses. This scenario may lead to a failure of economic development.

Is data / analysis needed to understand this?

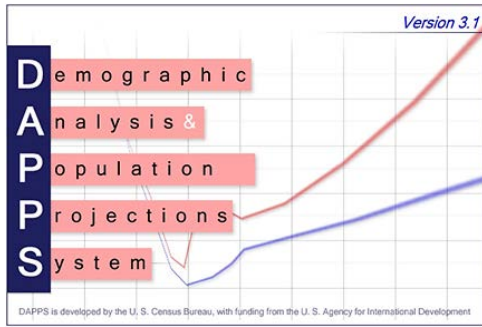
- Suggested variables:
- Age and sex
 - Foreign born and immigration
 - Hispanic/Latino origin
 - Language use at home
 - Migration/Geographic mobility

- Race
- Relationship to householder
- Dependency ratio

Overview of potential impact:

<ul style="list-style-type: none"> High Medium Low Unknown 				
	High	Low	Unknown	Unknown
	Low	Medium	High	Medium
	High	High	High	Medium
	Medium	Low	Low	Low

Want to know more about *Demographic Projections*



Inputs (Historic data)

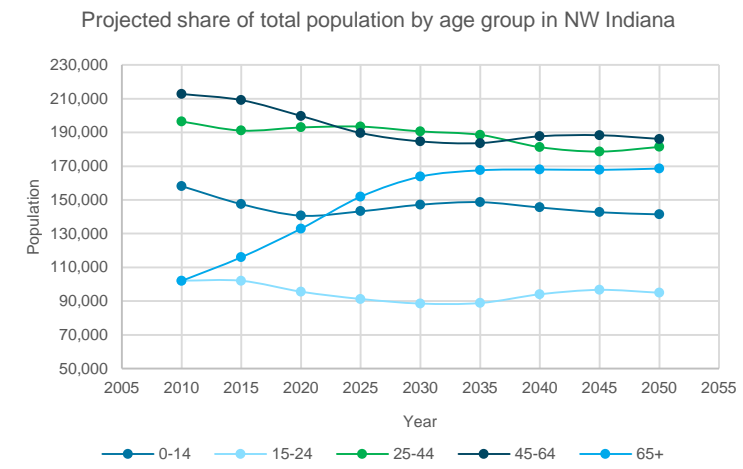
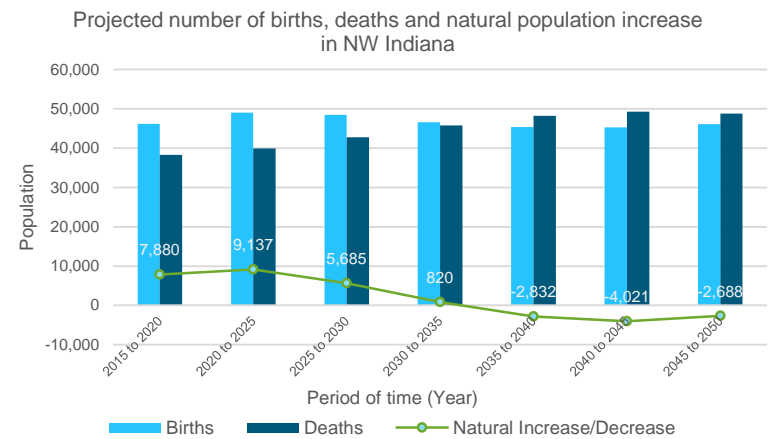
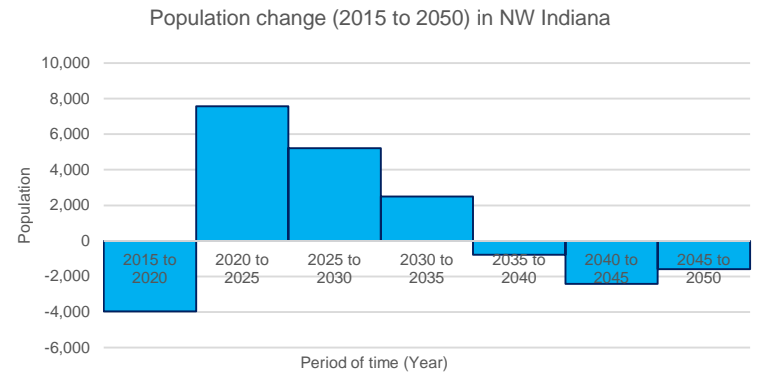
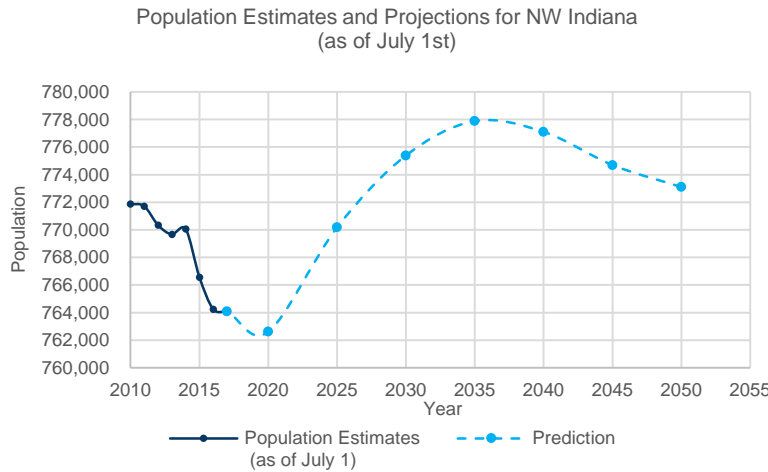
- ✓ Age-Specific and Total Fertility Rates by year
- ✓ Life Expectancy at Birth by sex
- ✓ Population
- ✓ Primary Migration by age

Available analysis methods

- ✓ Adjustment and projected population
- ✓ Mortality
- ✓ Fertility

Outputs

- ✓ Population
- ✓ Vital Events/Rates
- ✓ Total Fertility Rate
- ✓ Sex Ratio at Birth
- ✓ Life expectancy by sex
- ✓ Infant mortality by sex
- ✓ Age-Specific Fertility rates (by single years of age/5-year ages)
- ✓ Deaths by Age and Sex
- ✓ Migrants by type
- ✓ Age-Specific Death Rates by Sex



Data Source: STATS Indiana. 2018



Slow population growth

Why is this important?

Between 2010 and 2015 Indiana population grew by 2.1 % but the NWI region population decreased by 1%, which is below the state and national level. The reasons for that slow growth as stated by many are the weather and the economy. Also, offshoring of jobs of steel mills and auto manufacturing affected the Midwest and Indiana specifically in an extreme way.

When might this make impact?



Northwest Indiana population projection reflects that the population by the year 2020 will increase from 2010 by 3.5%. But the largest county, Lake County, will lose population.

How might this impact Northwestern Indiana?

Slow population growth can burden the regional economy with a narrower tax base, fewer job opportunities, and a smaller labor pool. Migration behavior in northwest Indiana is people moving from county to county or from city to city. Lake County's population shrank by 2.1% in 2017; however south Lake County communities show fast growth in Crown Point (6.4% change), St. John (15.8% Change), and Winfield (25.5% change). The spreading out of the population and urbanization of land despite no population growth will burden taxes and infrastructure. Slow population growth could have a positive effect if efforts made to attract large corporations and young professionals, create livable areas, and improve services to residents. This approach doesn't overwhelm the local infrastructure, increase housing prices, or escalate traffic congestion.

Is data / analysis needed to understand this?

- Net migration
- Building Permits number/ location
- Population projection

Overview of impact:

	Medium	Low	Low	Low
	High	Medium	High	High
	High	High	Medium	High
	High	Medium	Medium	Medium

* The high (●) is a negative impact and the low (●) is a positive impact

Want to know more about slow population growth

- Northwest Indiana should initiate a market plan to why it is worth living in northwest Indiana and to stay or move to the area. It should promote the quality of life that is found in Lake Michigan, the proximity to Chicago, the low cost of living and tax base, and the higher education levels. The area has an asset of concentration of research institutions that should be built upon to pioneer and attract new researches and people.
- Northwest Indiana could be a net energy producer using Wind Farms.
- Transit-oriented development (TOD) should be emphasized as an important tool in attracting all ages of people. If TOD is supported by coffee shops, shopping, services, and entertainment, more people will move to these TOD and urban areas. This type of development is expected to replace the traditional dying malls that is caused by the booming of the e-commerce.
- Local governments should encourage people to live next to transit and demonstrate the fiscal benefits of investments in transit, such as by quantifying the time savings of investments in better transportation infrastructure.

Northwest Indiana

Counties include: [Lake](#), [LaPorte](#), [Porter](#)

Largest City: Hammond (2017 population: 76,618)

Population per Square Mile: 504.2

Square Miles: 1,515.5

*Projection based on 2010 Census counts.

Population over Time	Number	Rank in State	Percent of State	Indiana
Yesterday (2010)	771,864	2	11.9%	6,484,125
Today (2017)	764,073	3	11.5%	6,666,818
Tomorrow (2020 projection) *	799,946	2	11.7%	6,852,121
Percent Change 2010 to Today	-1.0%	5		2.8%

Sources: U.S. Census Bureau; Indiana Business Research Center

Migration / immigration

Why is this important?

Migration and natural increase (births/deaths difference) are the two main demographic factors driving population change (IBRC, 2018). In the 2015 – 2020 period, population estimates show that net out-migration has been responsible for a population loss, even with a positive natural increase. Possible causes of this impact may be related to millennial generation conducts

along with the gravitational effect of the Chicago area. For some policymakers, the role of immigrants in the U.S. society represents a decline in job opportunities and national wage growth. Nonetheless, most academic studies find low effects on Americans' wages and opportunities over the long-term.

When might this make impact?



Migration flow estimates show negative effects on the population in the short-term range (current - 2030) and positive in the long-range (2030 - 2050). In the latter period, Northwest Indiana is

expected to gain population thanks to a high rate of net in-migration, mostly allocated in Porter County where migration flow will be a sensitive driver of population change.

How might this impact Northwestern Indiana?

Recent studies confirm that immigration leads to positive effects for natives and the economy over the next decades. With about 15 percent of U.S. residents born in a foreign country, historical series of socio-economic data demonstrates that immigration leads to more innovation and creativity, a workforce with higher education levels, better fit of skills with jobs, and economic growth.

As the net out-migration in NW Indiana represents a challenge over the next decade, in addition to baby boomers moving into retirement, immigration may help to keep the region relatively young and decreasing the cost of retirement benefits for rising elderly residents.

Is data / analysis needed to understand this?

- Suggested variables:
- Health insurance coverage
 - Income and earnings
 - Industry and occupation
 - Poverty status
 - The Gini coefficient

Overview of potential impact:

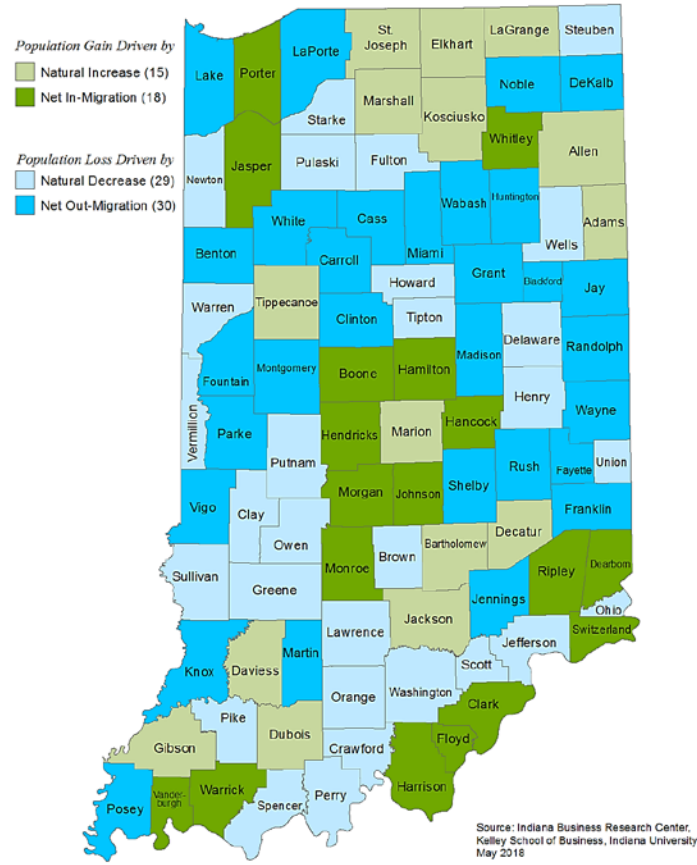
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			Medium	Medium
	High	High	High	High
	High	Medium	Medium	High
	Low	Unknown	High	High

Want to know more about Migration

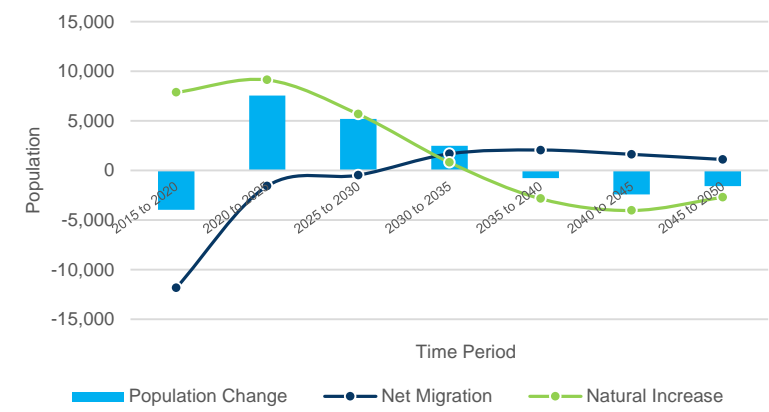
- Generations. <https://www.careerplanner.com/Career-Articles/Generations.cfm>
- STATS Indiana. http://www.stats.indiana.edu/article_index.asp#Projections
- Indiana Business Research Center. <https://ibrc.kelley.iu.edu/analysis/cemr/us-summary.html>
- The National Academies of Sciences, Engineering, and Medicine. Strategic Issues Facing Transportation, Volume 6: The Effects of Socio-Demographics on Future Travel Demand. <http://nap.edu/22321>
- The National Academies of Sciences, Engineering, and Medicine. Understanding Changes in Demographics, Preferences, and Markets for Public Transportation. <http://nap.edu/25160>
- US Census Bureau. <https://www.census.gov/prod/2010pubs/p25-1138.pdf>
- Urban Policy and the Census. <https://esripress.esri.com/storage/esripress/images/200/chapone.pdf>
- CMAP 2050 Vision Plan (Draft). <https://www.cmap.illinois.gov/2050/draft/principles/inclusive-growth>. <http://www.cmap.illinois.gov/onto2050/socioeconomic-forecast>
- US Census Bureau. A Compass for Understanding and Using American Community Survey Data: What State and Local Governments Need to Know. <https://www.census.gov/content/dam/Census/library/publications/2009/acs/ACSstateLocal.pdf>
- Indicators. <http://indianaindicators.org/maps-and-data.aspx>
- Indiana Business Research Center. Indiana's Housing Market. 2018. http://www.ibrc.indiana.edu/studies/IAR_2018_Final.pdf
- Demographic drivers of Indiana housing market continue to lag. 2017. <http://www.incontext.indiana.edu/2017/jan-feb/article1.asp>
- Indiana Business Research Center. Indiana's elderly population projected to climb sharply. 2017. <http://www.incontext.indiana.edu/2018/july-aug/article2.asp>

Population Projections

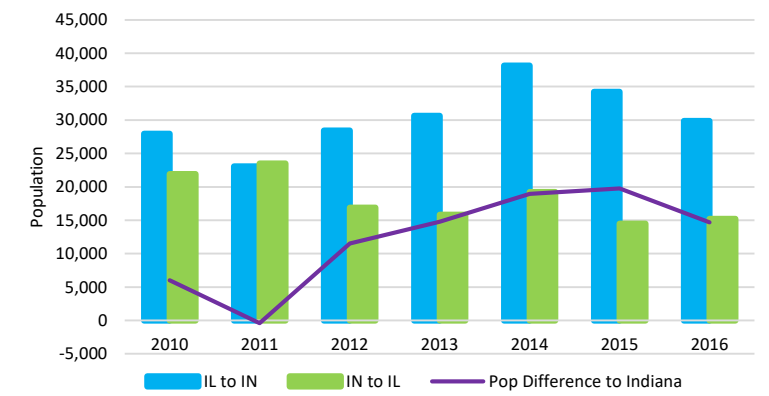
Components of Change, 2015 to 2050



Population Drivers 2015 to 2050 in NW Indiana



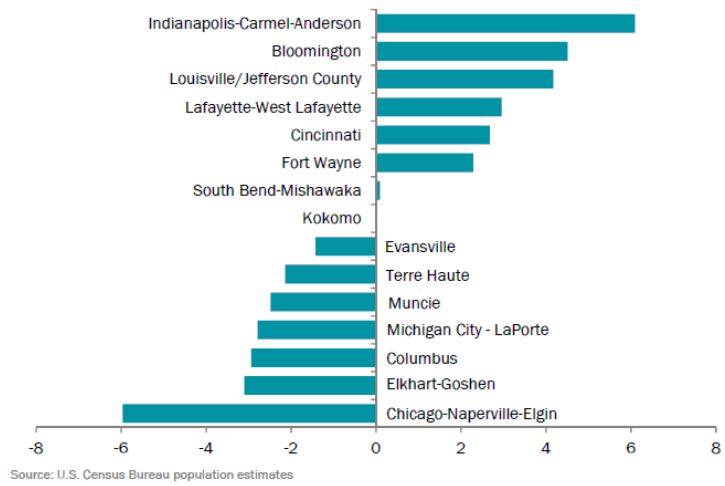
Indiana/Illinois Migration



Credits: Peter Kimball

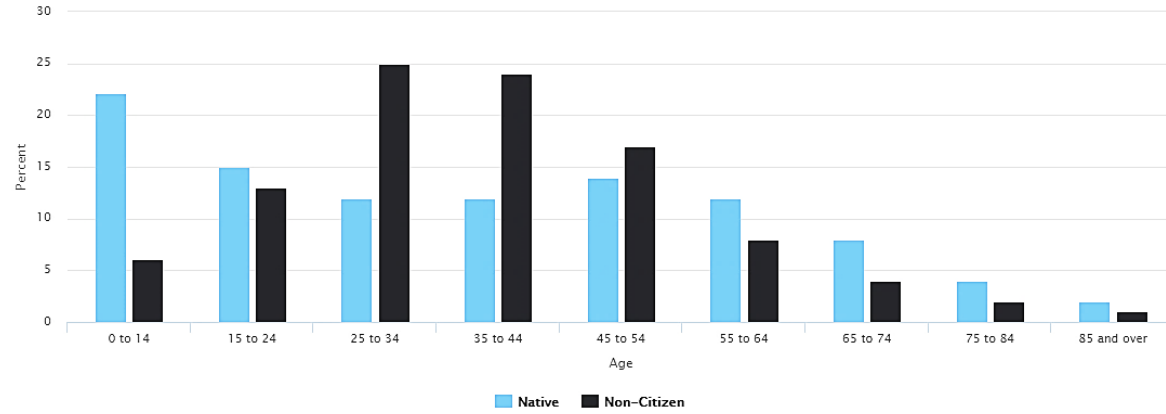
Want to know more about **Migration patterns**

Net Migration Rates for Select Metro Areas, 2017

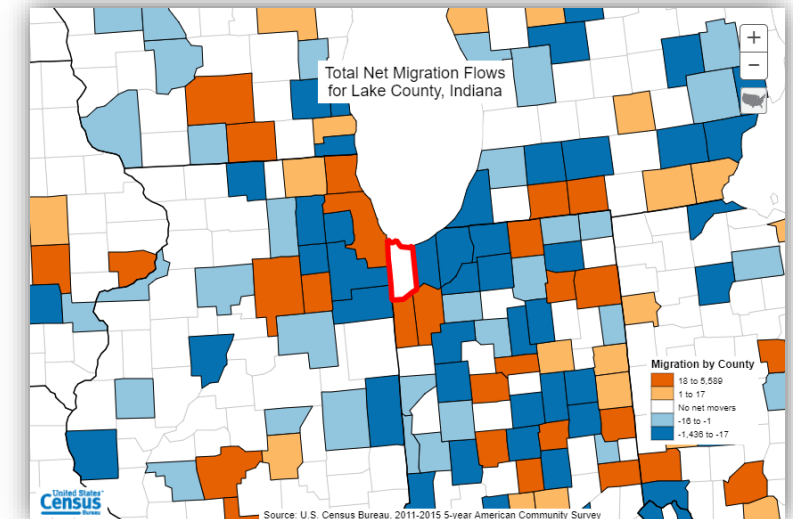
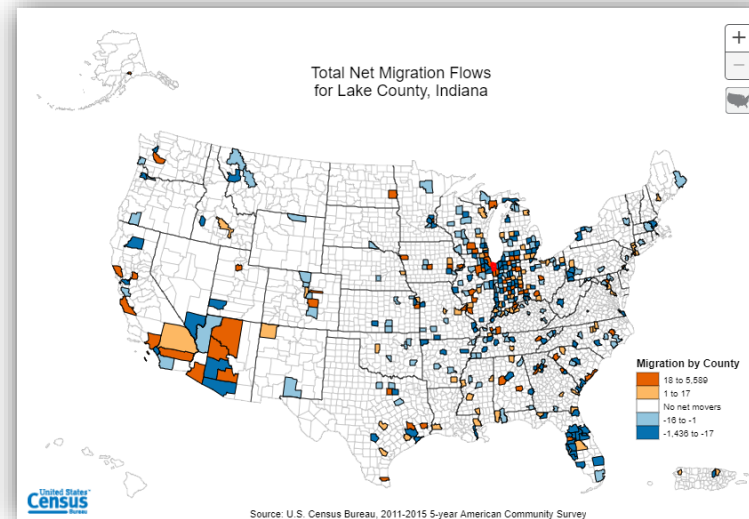


Source: Indiana Business Research Center (2018)

Age Distribution of Natives and Non-Citizen Immigrants, 2012



Source: Current Population Survey, Annual Social and Economic Supplement.



Jobs and personal income

Why is this important?

To understand the economic behavior of the Northwest Indiana area allows to devise and promote policies that support income and workforce development, competitiveness, productivity, a healthier environment, poverty reduction, and short work commute times. According to the Indiana Business Research Center, during 2017 Indiana kept a similar behavior of income

growth compared to the nation, while employment was roughly lower than the national growth. Overall, 35000 new jobs are projected through 2019 in Indiana.

When might this make impact?



For a short-range forecast period from the second quarter of 2018 to the end of 2021, an optimistic scenario is projected. The Indiana economy will be growing at a roughly equivalent rate of the nation. Thus, personal income in Indiana is projected to reach 4.7% and job growth about 3.7% for both nation and Indiana State.

In a long-range perspective (2016-2037), the average growth rate of total Gross State Product is expected to reach 2.47% per year. Employment is predicted to have a positive rate of growth at 0.63%, with employment in manufacturing industry dropping at a 0.66% rate, while non-manufacturing areas growing at a 0.86% rate (IBRC, 2018).

How might this impact Northwestern Indiana?

Risks associated with this future scenario are a matter of concern due to population decline which may be explained as labor force loss and brain drain. In addition to that, companies may tend to produce less generating rising prices for goods and services, which may likely lead to higher values of inflation. Political environment draws several uncertainties in the future caused by unpredictable movements in laws and regulations and

international relationships. Belligerent trade competition of international markets and domestic/international migration of workforce may influence the economic development. On the other hand, Chicago metropolitan area offers regional opportunities through employment and income growth during the upcoming decades.

Is data / analysis needed to understand this?

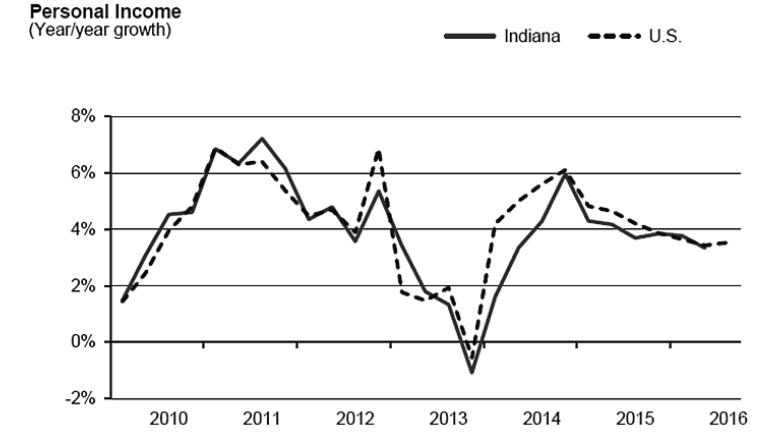
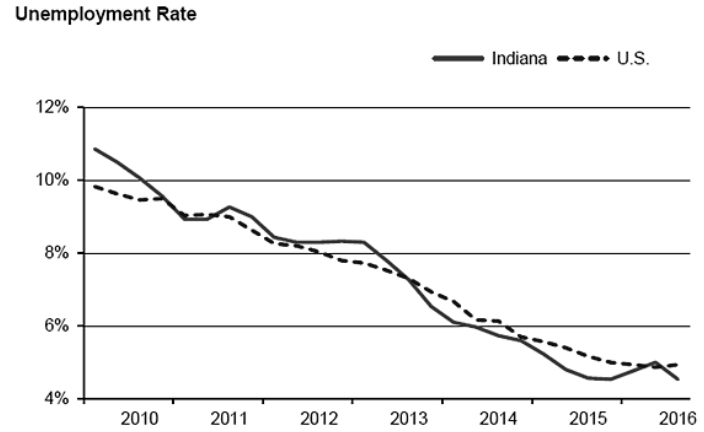
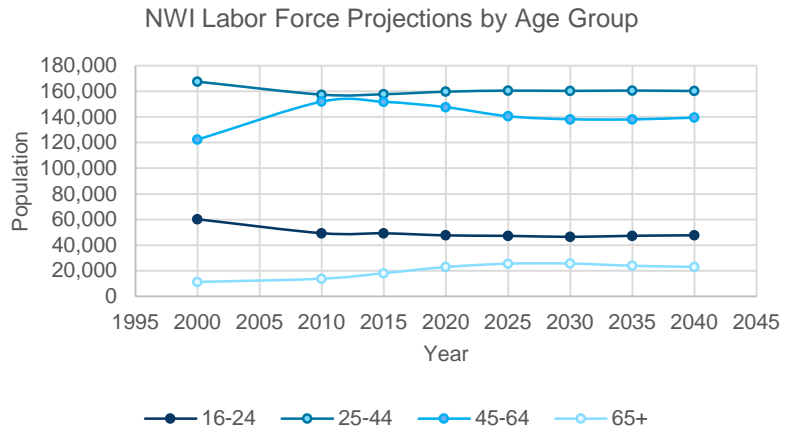
- Suggested variables:
- Class of worker
 - Commuting (journey to work) and place of work
 - Employment status
 - Food stamps/Supplemental Nutrition Assistance Program (SNAP)

- Health insurance coverage
- Income and earnings
- Industry and occupation
- Poverty status
- Inflation

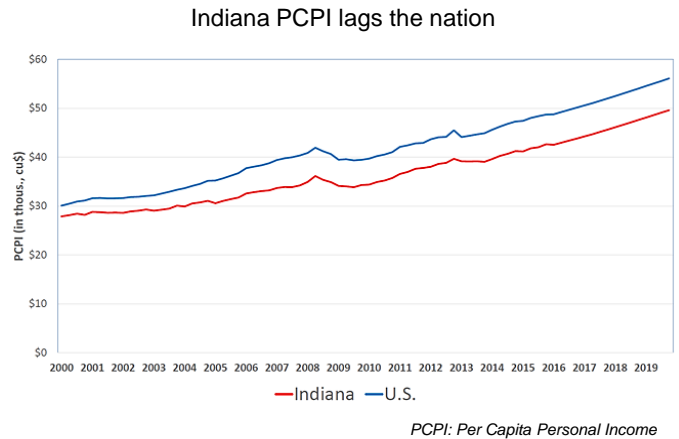
Overview of potential impact:

	Medium	Medium	Low	Medium
	High	High	High	High
	High	High	Low	High
	High	High	Medium	Medium

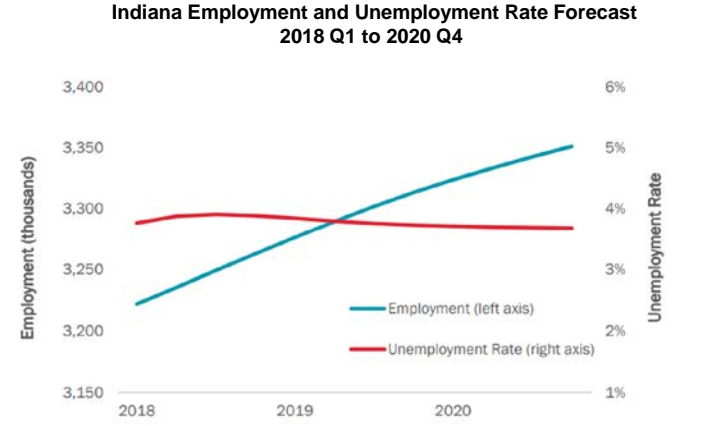
Want to know more about **Jobs and Personal Income**



Source: Indiana at a Crossroad? Indiana Business Research Center, 2017



PCPI: Per Capita Personal Income



Source: Indiana University Center for Econometric Model Research and Indiana Business Research Center (released in March 2018)

Housing market

Why is this important?

Housing market can be considered as a demographic influencer of migration, attractiveness of the region, and household formation rate. At the national level, the housing market is slowing down, prices and interest rates are rising, and inventory is down. While Indiana's housing market preserves the national behavior of high demand and low supply in a smaller scale, local experts consider that the region is in good shape today and for a

while longer (IBRC, 2018). This positive climate offers attractive opportunities for current and potential residents reflected in the highest number of existing-home sales in the State for 2017, an exceptional house price appreciation, a lower foreclosure rate, gradual increase of residential construction, and mortgage rates projected to keep below 5% over the next years.

When might this make impact?

- Existing
- Trending
- Emerging
- Speculative

↑
 Indiana has reached the state's highest level of household formation rate during the recent years due to a considerable migration represented in a net inflow of 10,400 people in 2017

and expecting to increase. Then, the housing market is impacting the population growth rate in the present and will likely be over the next decades.

How might this impact Northwestern Indiana?

Housing market in Indiana is predominantly influenced by high demand and low supply due to an exploited tendency to purchase existing houses in 2017 with overall sales up 2.4% in comparison with 2016. Availability of houses in 2017 was 17% lower than in 2016 and this latter 15% down respect to 2015. This economic behavior leads to a house pricing raise, decline of rental vacancy rates, and rising mortgage interest rates.









Therefore, potential impacts in the future are reduced options for housing affordability, geographical mobility/migration based on the explosion of a millennial generation with variable household formation rates. Although this phenomenon can fluctuate through short-time periods, regional impacts may usually be also perceived in the long-range.

Is data / analysis needed to understand this?

- Suggested variables:
- Computer and Internet use
 - Occupancy/Vacancy status
 - Rent
 - Rooms
 - Tenure (Owner/Renter)

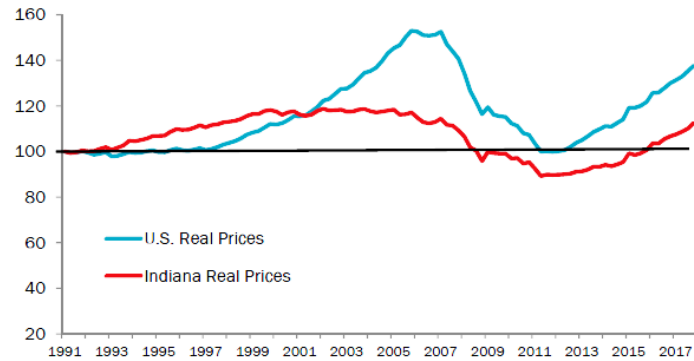
- Value of Home
- Vehicles Available
- Year Structure Built

Overview of potential impact:

				
	Medium	Medium	Unknown	Unknown
	High	Low	Low	Low
	Medium	Unknown	Unknown	Unknown
	Low	Low	Low	Low

Want to know more about *Housing Market*

House Price Index Adjusted for Inflation, 1991 Q1 to 2017 Q4

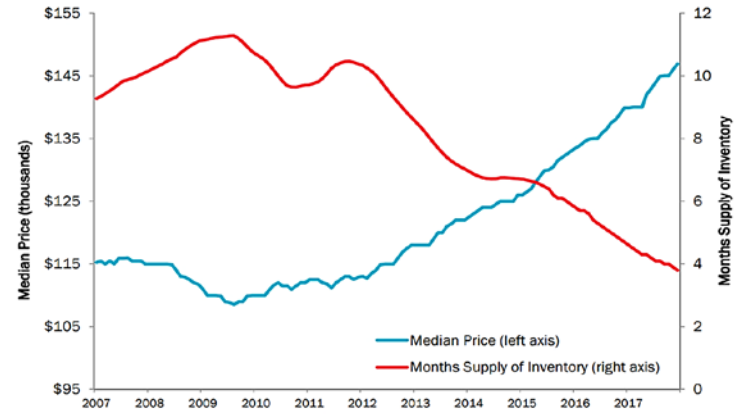


Note: The HPI values are adjusted for inflation using the Consumer Price Index for all items less shelter (Series SAOL2)
 Source: Federal Housing Finance Agency, House Price Index (expanded data series, seasonally adjusted)

Source: The State's of Indiana's Housing Market. 2018

The FHFA House Price Index (HPI) is a broad measure of the movement of single-family house prices. The HPI is a weighted, repeat-sales index, meaning that it measures average price changes in repeat sales or refinancings on the same properties.

House Median Sales Price and Months Supply, 12-Month Moving Average, January 2007 to December 2017



Source: Indiana Business Research Center (2018)

Indiana Housing Market by the Numbers

	U.S.	Indiana
Existing-Home Sales, Percent Change between 2016 and 2017	1.1%	2.4%
House Price Appreciation, 2016 Q4 to 2017 Q4	7.0%	6.6%
Residential Building Permits, Number of Units, Percent Change between 2016 and 2017	6.2%	15.8%
Foreclosure Rate, 2017 Q4	1.2%	1.4%
Months Supply of Inventory, 2017 Average	4.4	3.8
Rental Vacancy Rate, 2018 Q1	7.0%	8.5%

Sources: Indiana Association of Realtors, National Association of Realtors, Federal Housing Finance Agency, U.S. Census Bureau, Mortgage Bankers Association

Women participation in the workforce

Why is this important?

The role of women in the workforce has been experiencing a remarkable exponential growth across the decades. Although U.S. women still face a gap in gender wage, they have higher chances to enroll in and complete college than men. According to the Population Reference Bureau, women have to obtain at least one additional degree to receive the same wage as men with less education.

This gap is narrowing largely thanks to a worldwide effort for promoting and increase the access to education centers. This global progress brings to our region a prosperous environment in terms of equal opportunities, diversity, innovation, and better household incomes leading to a regional economic growth.

When might this make impact?



Positive changes toward workforce increase through women participation has a steady tendency to be achieved along the next decades.

How might this impact Northwestern Indiana?

A balance between female and male participation in the wealth distribution and workforce leads to a higher economic development in Northwest Indiana. The transitional change between Baby Boomers and Millennials offers new challenges in terms of overall workforce contribution which women participation play a leading role to support Indiana

aging population impact. Overall, this influencer opens opportunities for economic and political development through strategies increasing women's educational attainment and therefore, stronger workforce participation.

Is data / analysis needed to understand this?

- Suggested variables:
- Total population by age and sex
 - Educational attainment
 - Fertility
 - School enrollment
 - Undergraduate field of degree

Overview of potential impact:

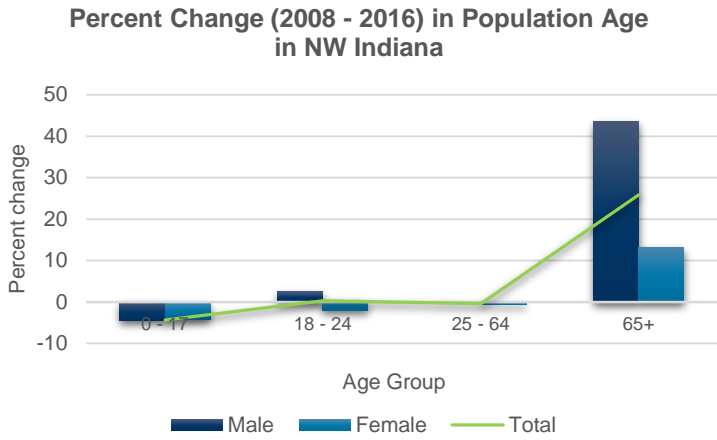
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	High	Low	High	High
	High	High	High	High
	Low	Low	High	Medium

Want to know more about Women Participation

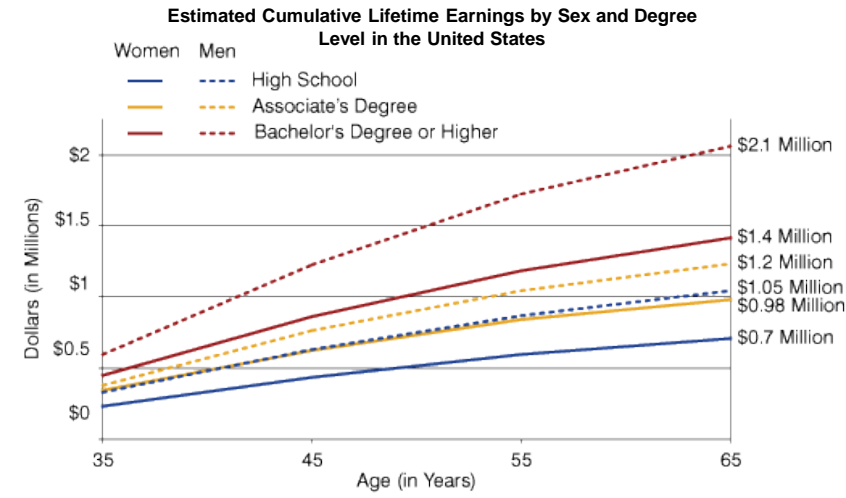
Population Reference Bureau. The U.S. Gender Wage Gap. 2018. <https://www.prb.org/insight/progress-in-u-s-womens-well-being-stalled-in-recent-generations/>

Environment and Society, a critical introduction. Paul Robbins, John Hintz and Sarah A. Moore. 2016

Indiana Business Research Center. Earnings of a Lifetime: Comparing Women and Men with College and Graduate Degrees. 2009. <http://www.incontext.indiana.edu/2009/mar-apr/article1.asp>

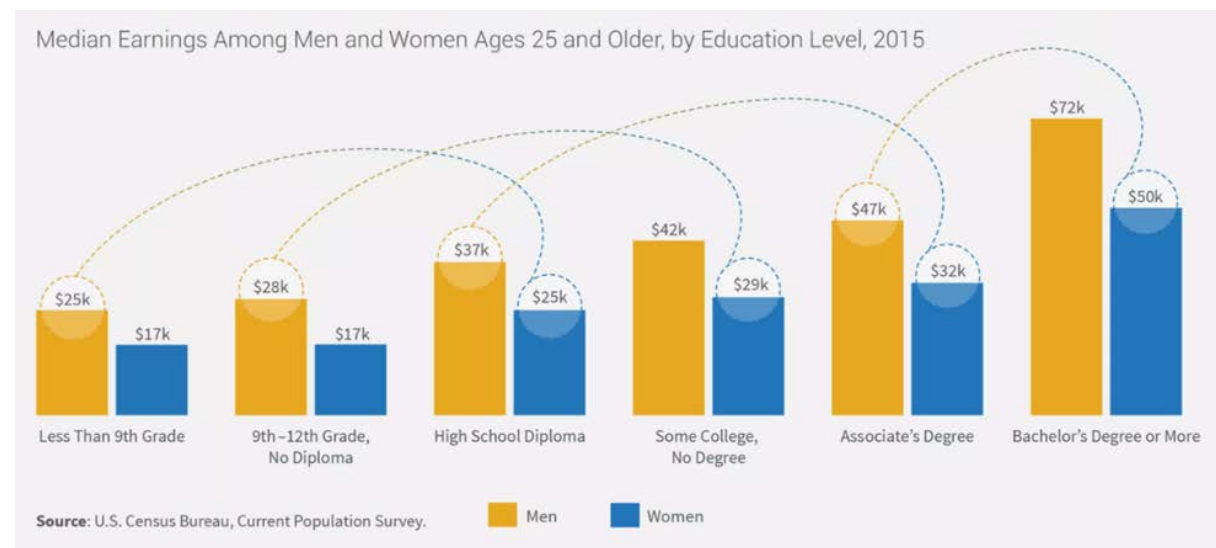


Source: Environment and Society (2016)



Note: This chart uses census data based on the average wages of 10-year cohorts by degree level. Figures use 2006 dollars and future earnings have been discounted at 3 percent. Source: IBRC, using U.S. Census Bureau income data

Source: Indiana Business Research Center (2009)



Source: U.S. Census Bureau, Current Population Survey.

Source: Population Reference Bureau (2016)



2050 Plan | influences + futures

Economy

E-commerce

Why is this important?

E-commerce is doubled in the last two years and tripled in the last decade. Online shopping is driving up demand for small package home delivery, which could soon substitute for many household shopping

trips. E-commerce has changed American cities, traditional malls have been devastated and large retail are going out of business, which it will change future development and demand.

When might this make impact?



E-commerce took place 25 years ago and it will continue to grow. As of today, Amazon accounts for 34% of the US e-commerce and will grow by 50% in

the year 2021. In the future, shopping will be done from home and malls are projected to turned into logistics hubs, supply spaces or become public spaces.

How might this impact Northwestern Indiana?

- Northwest Indiana is facing the nationwide retail apocalypse. Empty big-box stores and more storefronts have gone dark in the last decade. However, developers are looking at NWI to establish e-commerce distribution centers and warehouses. Community leaders are investigating ways to repurpose the vacant large retail into other uses.
- Urban freight delivery growth is expected to expand 40% by 2050 and smart logistics infrastructure is needed to mitigate congestion.
- Northwest Indiana workforce should prepare for future Job

demand that includes IT experts, call in centers, distribution centers and warehouses, packaging, online web content writers, photographers, designers, telecommuting, home-based business, freight drivers..etc. Workforce training should accommodate e-commerce jobs and the advance technology.

Is data / analysis needed to understand this?

- Distribution centers/ intermodal facilities data (location map- how many: current and future)
- Freight data projection

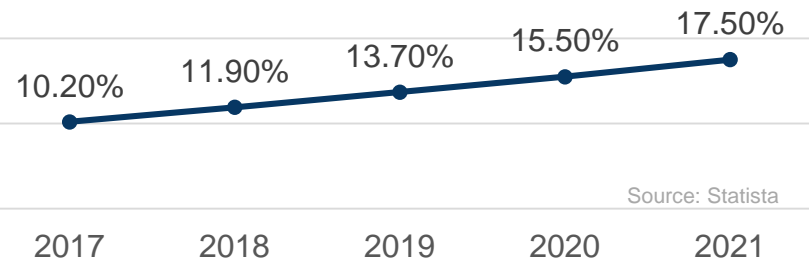
Overview of potential impact:

	Low	High	Medium	Medium
	High	High	Low	High
	High	Medium	High	High
	High	High	High	High

Want to know more about
 electronic commerce (e-commerce)

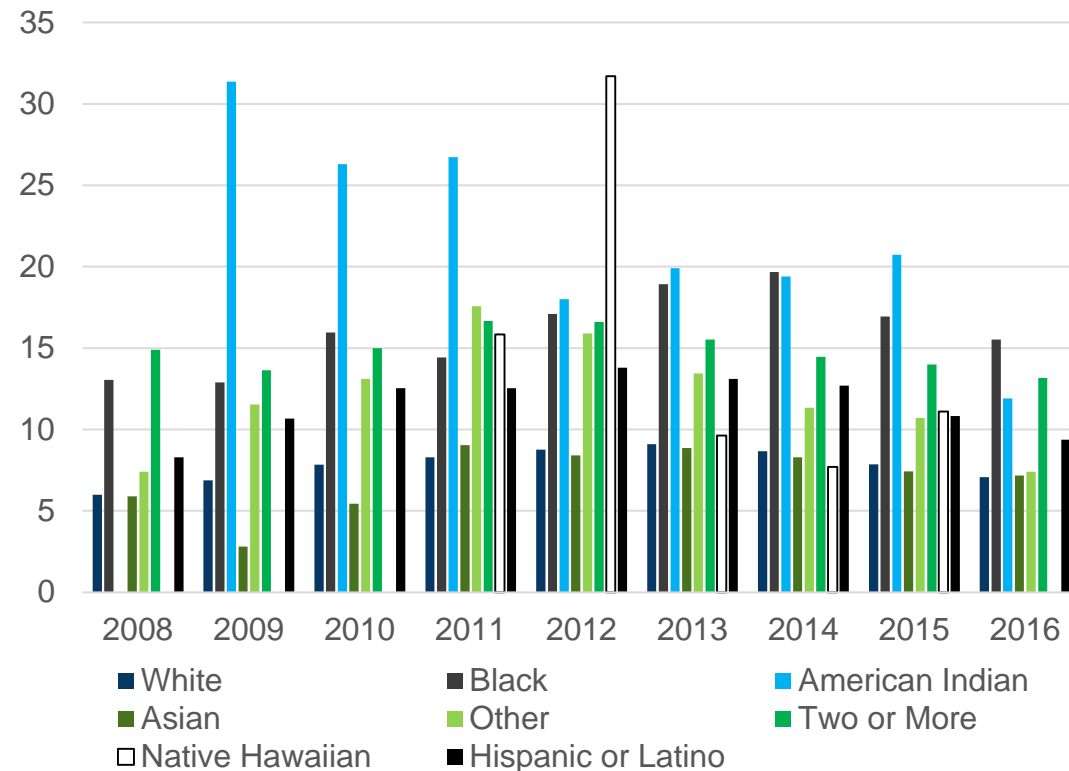
Ecommerce Share of Total Global Retail

Data Projection for 2018-2021



According to the Progressive Policy Institute, the number of e-commerce and warehousing jobs has increased by 400,000 in the past decade, easily offsetting the loss of 140,000 brick-and-mortar retail jobs.

Unemployment by Race 2008-2016



Source: U.S. Census Bureau

Global competitiveness / economy

Why is this important?

The Midwest/ Indiana is underperforming because it is unattached from the global economy. It has experienced a trend of de-clustering of businesses. Oftentimes, town and cities face decline because of economic invest occurring from only one particular industry. As technology advances the region needs to

maintain a level of adaptation in industrial output as well as look to new opportunities in industry.

When might this make impact?



Global competitiveness has had an impact in Northwestern Indiana for years as dynamics between industrial leaders and partnerships change over time. More recently, steel production in

the region is being directly affected through tariffs imposed on steel with the United State's trade partners.

How might this impact Northwestern Indiana?

Technologies in steel production may allow for a greater production; however, more automation and higher efficiency has meant less jobs in the steel mills meaning NWI needs to continue to find industries that will hold value on a global level.

Additionally political moves and ideologies in trades and tariffs will also impact the demand for product in the NWI region.

Is data / analysis needed to understand this?

- Input/output of steel between the United States and trade partners
- Regional Poverty/ Income data
- Largest Industries in NWI

Overview of impact:

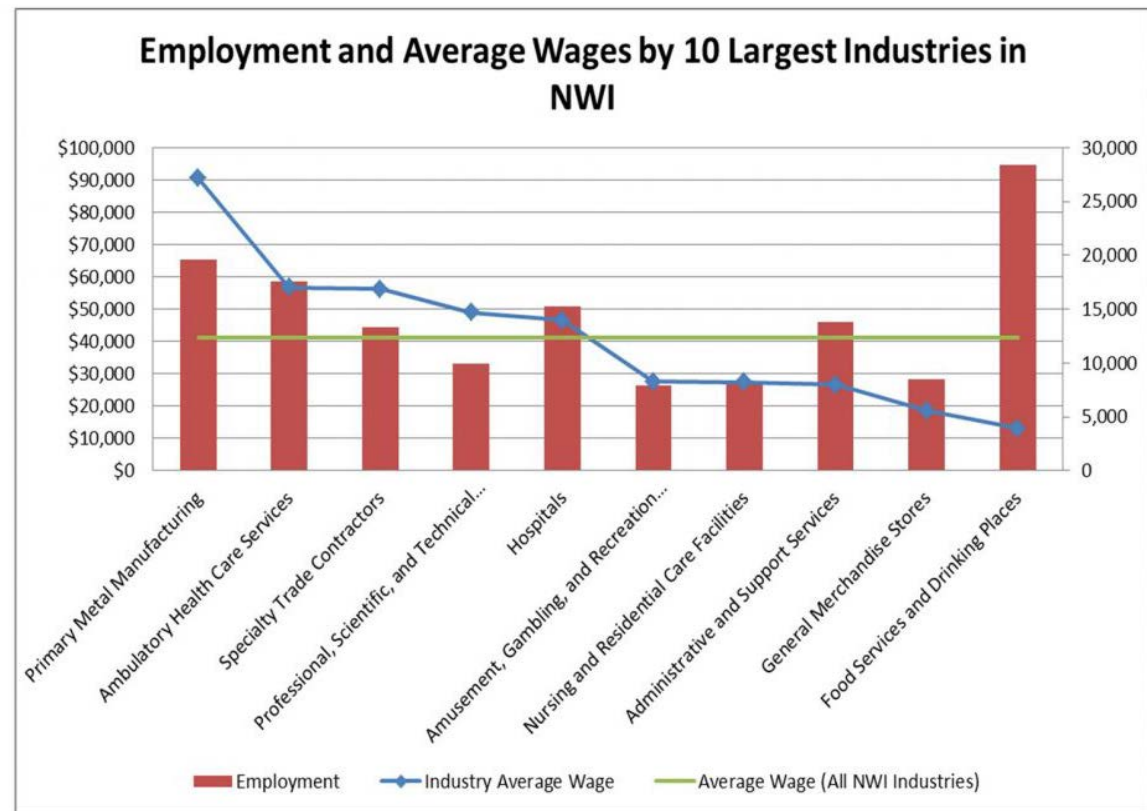
	Unknown	Medium	Low	Unknown
	High	High	High	Medium
	Medium	High	Medium	Medium
	Low	Medium	High	High

Want to know more about
Global Competitiveness/ Economy

U.S. Steel Production, Exports, and Imports in Thousands of Short Tons

Year	Domestic Production	Exports	Imports
1949	69,192	5,910	112
1959	62,124	6,919	n/a
1969	93,887	5,299	14,034
1979	100,300	2,800	17,500
1988	102,700	2,100	20,000
1998	102,400	5,500	41,500

Source: Statistical Abstract of the United States: 1950, 1960, 1970, 1980, 1990, 2000.



Source: U.S. Census Bureau

Containerization (blockchain)

Why is this important?

Containerization is on the brink of the largest technological advancement, Blockchain (an electronic ledger system that allows interactions to be verified autonomously), since the standardization of the containers in the 1960's. Paperwork and collaboration that occurs between buyers, sellers, brokers,

banks, and governments allowing for human error and long delays in the shipping process. Although consolidation has lowered the number of carriers in use, the behaviors of those involved in operations have not changed.

When might this make impact?



While the shipping companies have already established a standardized container and consolidation, they have yet to implement a blockchain system eliminating the need for traditional paperwork. In January 2018, Maersk and IBM announced a joint venture in creating a blockchain platform that

will provide a secure and efficient collaboration between all parties involved with a shipment; this will eliminate then need for paperwork.

How might this impact Northwestern Indiana?

Northwest Indiana is a great freight hub in central United States home to the Port of Indiana Burns-Harbor. Not only is the region a major transportation corridor, but it also has connection to the Atlantic via the St. Lawrence Seaway. According to the Port Director Rick Heimann, "May (2018) was a busy month at the Ports of Indiana-Burns Harbor with 15 international ships." This technology could allow for more capacity by providing real-time data in ETA by analyzing check-ins, weather, tariffs, and other

factors related to delivery. Additionally, with the transfer of traditional paperwork to the cloud, approvals and necessary paperwork can be completed immediately, cutting down the time a ship sits in port.

Is data / analysis needed to understand this?

- Port data/reports from Maersk-IMB prototype programs
- Analysis of agreement/collaboration between all parties in the shipping process

Overview of impact:

	Low	Low	Medium	Medium
	Medium	High	Low	High
	Medium	High	High	High
	High	Low	High	High

Want to know more about the Blockchain System

- The supply chain will be digitized using a number of technologies to complete all shipping processes (Figure 1). While these were typically done completed from point to point via paperwork, the associated parties (Figure 2) now all have access to the entire process via the cloud and online data.
- “A new study found that the Great Lakes shipping to ports such as the Port of Indiana-Burns Harbor and the Port of Chicago on the South Sides pumps \$25.6 billion into the economy and supports 237,000 jobs, including 147,000 in the Midwest.



Figure 2. Source: <https://www.maersk.com/stories/maersk-and-ibm-launch-digital-joint-venture>

Technologies enabling the digitalization of the supply chain

New technologies	Pre-transaction		Transaction processing			After transaction	
	Product selection	Data entry	Workflow management	Document check	Compliance check	Problem resolution	Client mgmt. information system
Optical character recognition (OCR)		Text recognition from trade documents to minimize data entry		Check for completeness of documents based on transaction/product type	Scrape documents for AML keyword hit		
Artificial intelligence (AI)	Intelligent and personalized marketing: Offer new product sales or client promotions based on insights on clients' needs and behaviors	Populate fields with text extracted from documents (integrate OCR with transaction process)		Validate/remediate data with cross-references, machine learning	Contextual filtering: Identify suspicious or unusual activity and block suspicious transactions based on predictive indicators	Intelligent problem resolution: Track individual error rates and flag users in need of remediation	
Advanced analytics (AA)		Enhanced KYC (e.g., web scrape)	Efficient process and productivity monitoring, and predictive analytics to detect patterns				Reports enable enhanced operational and strategic decisions
Robotic process automation (RPA)			Bridge data flow and communication: Integrate data from different systems into single interface				
Internet of things (IoT)			Ease of tracking goods and documents; dynamic pricing and financing triggered by shipment events; automated payments release based on "smart contracts"			Track document locations: Track goods (location, volume, quality)	
Distributed ledger technology (DLT)	Create smart letter or credit as smart contract on distributed ledger auto notifications	Replace documentation, checks, data entry, validation, with single digital record	Real time verification and reconciliation; workflow executed as per smart contract conditions; replace payment and funds transfer with cryptocurrency				

Source: Bain & Company
This information is confidential and was prepared by Bain & Company solely for the use of our client; it is not to be relied on by any 3rd party without Bain's prior written consent

Figure 1

Tourism

Why is this important?

Tourism is currently ranked the seventh largest employment industry in the United States at 3.9%, and it is projected to move to the sixth largest industry by 2023. Tourism can be used a way to create jobs in the region in addition to exhibiting beneficial aspects or enabling visitors to be exposed to the great quality of life a region or municipality has to offer.

When might this make impact?



Tourism has had a steady presence in the United States since the mid 1800s as transportation technology advanced. While there is currently a dip in international tourism numbers to the U.S., likely due to the political climate, tourism still offers an industry

that can be enhanced with technological advances that promote interconnectivity. Utilizing social media platforms and taglines is crucial in gaining an online presence as well as free promotion through UGC (user generated content).

How might this impact Northwestern Indiana?

Northwestern Indiana is situated in a unique location along Lake Michigan and within close proximity to the third largest city in the United States, Chicago. The region already offers the Indiana Dunes National Lakeshore, sporting events, museums, trails, resorts, shopping, and dining. The region can grow jobs and

potentially the population by attracting visitors. Northwestern Indiana may see these benefits in the region by continuing to make investments that will enhance the tourism industry.

Is data / analysis needed to understand this?

- Data on tourism industry for NWI
- Tourism trends with UGC

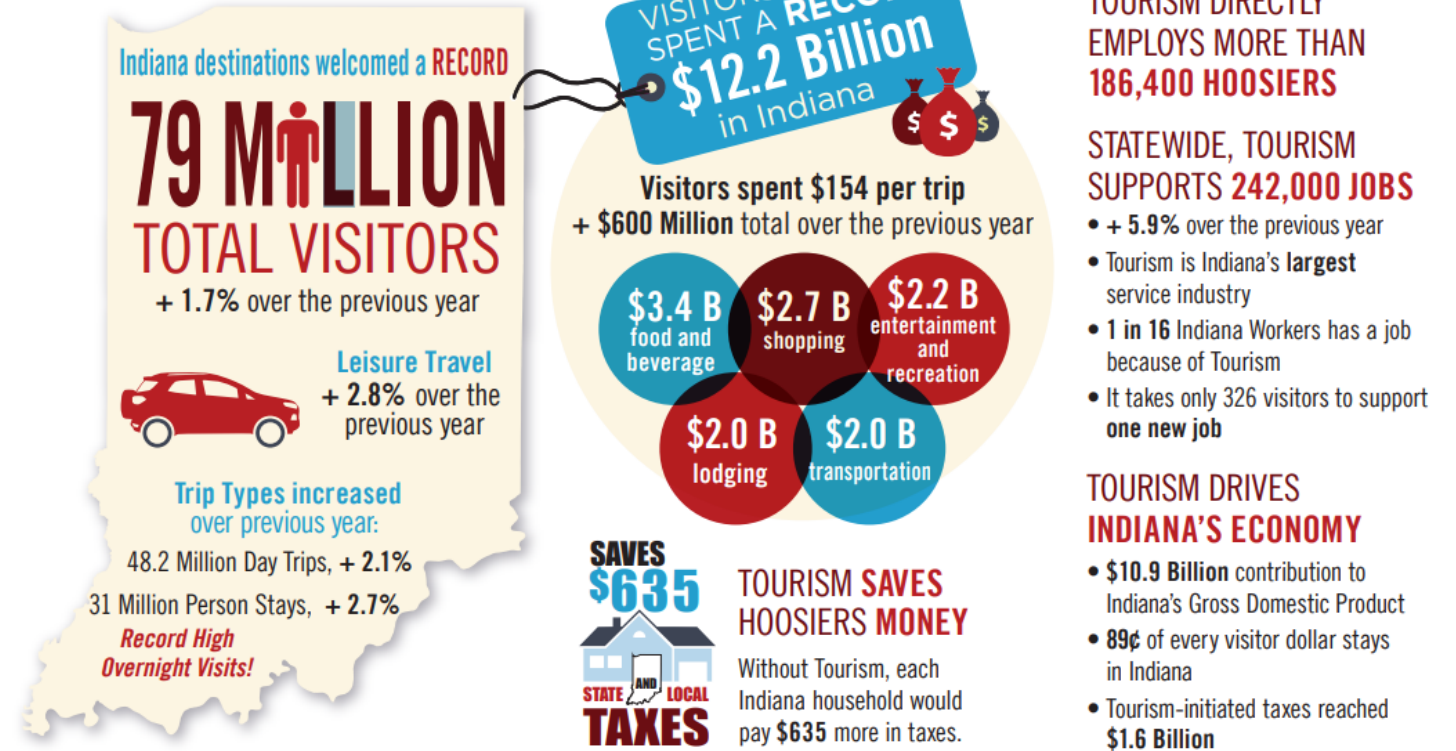
Overview of impact:

	High	Medium	High	Medium
	Medium	High	Medium	High
	Low	Low	Low	High
	High	High	Medium	High

Want to know more about tourism

- Indiana has seen an increase in tourism over the past few years including a record increase during 2017 with visitors spending a total of \$12.2 billion.
- In 2017, tourism supported 242,000 jobs.

Another **RECORD** year for **INDIANA TOURISM**



Indiana Office of Tourism Development, 2017

This is the fifth consecutive year tourism's economic impact was measured. This study used data from 2016, the most recent year complete data was available. The study was commissioned by IOTD and conducted by Rockport Analytics, an independent market research and consulting company that specializes in economic impact and feasibility studies for the travel, tourism and hospitality industry.

www.VisitIndianaTourism.com

Source: Indiana Tourism

Trades and tariffs

Why is this important?

Tariffs affect the economy at the national, regional, and local levels. These tariffs modify the consumption of good imported to the U.S by shifting costs, employment, and production across the country. Although the reasoning behind a tariffs and

trades should be to boost the economy, some regions may face externalities because of industries tied to their geographic locations.

When might this make impact?



Tariffs and trades have been used in international trades for centuries; however, each tariffs are highly politized and will change from year to year based on economic standings and political motivations. The United States is currently experiencing

changes in tariffs and trade policy with the present day political leader.

How might this impact Northwestern Indiana?

The current imposed tariff on steel is 25% and 10% on aluminum. This is a good thing for the largest domestic steel producers in the United States, Northwestern Indiana. According to Maureen Groppe of *USA Today*, "No state has more to gain than Indiana from President Trump's steep new tariffs on steel and aluminum imports. And no state has more to lose either." While the region does produces these raw materials, they also manufacture using

the same materials. The steel and aluminum industry may "win", but the manufacturers in the region face increased production costs which may ultimately lead to consolidation and layoffs.

Is data / analysis needed to understand this?

- Data on manufacturing costs pre/post tariffs
- Data on steel/aluminum production

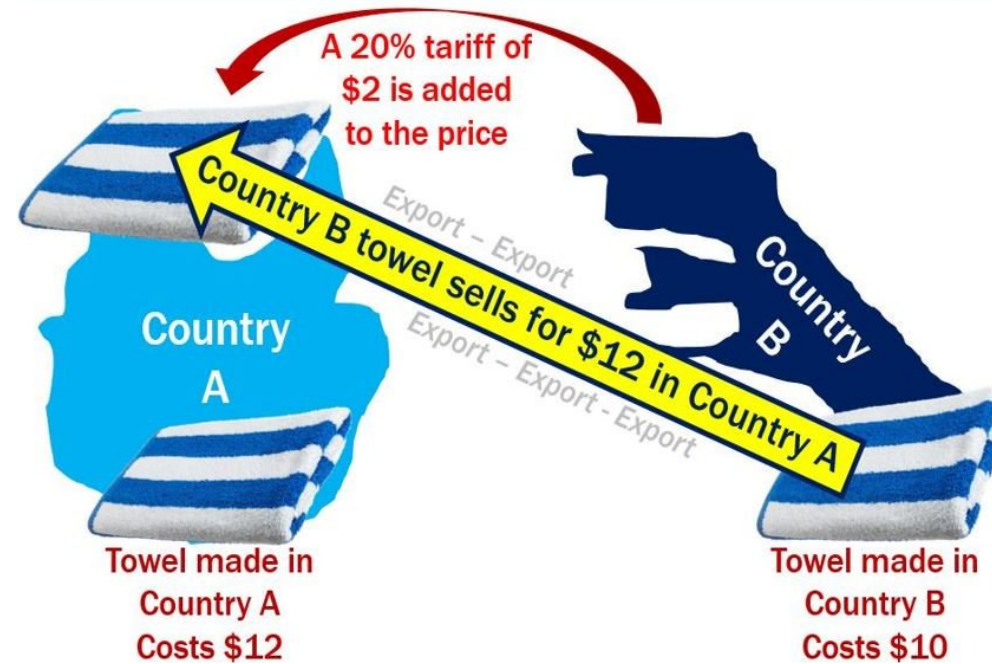
Overview of impact:

	Low	Low	Low	Medium
	Low	High	High	Low
	High	Low	High	High
	Medium	Low	Low	High

Want to know more about
trades and tariffs

- <https://www.commerce.gov/news/press-releases/2018/03/us-department-commerce-announces-steel-and-aluminum-tariff-exclusion>

How Tariffs Work



Source: <https://marketbusinessnews.com/financial-glossary/tariffs-definition-meaning/>

Entrepreneurial Capacity

Why is this important?

Connectivity between educational institutions, entrepreneurs, existing industry, and future technologies are crucial for maintaining a vibrant and economically healthy community. Entrepreneurial capacity can provide initial investment in

communities and even provide a positive mindset in the potential for municipalities and regions. Utilizing capital venture and incubators are key in supporting new small business.

When might this make impact?



Cities across the U.S. have seen reinvestment as well as incubators supporting local and small business startups. Industries have begun to adapt the spread and the absorption of the role technology plays in day to day life. Investor and companies have already started to renovate and convert old

industrial buildings to multiple uses including housing, retail, and tech focused industries such as data centers.

How might this impact Northwestern Indiana?









Northwestern Indiana sets the stage for businesses or lifestyles in the region with greater connectivity and access to Chicago and a National Lakeshore. The region faces a level in uncertainty with how business and production will react to tariffs on steel and aluminum. Initial steps have been taken in investing in physical capital with interest in a data center facility in Hammond, Indiana. A step like this can lead to producing a tech industry with in the region with a tech incubator, connections to educational

institutions, and clean jobs. If Northwestern Indiana is able to attract new companies and industry, they will be able to retain talent within the region. Indiana will be able to offer a cheaper option in data storage than larger data centers in Chicago.

Is data / analysis needed to understand this?

- Case studies on comparable regions in start up industries
- Data on labor pool in region
- Data on programs offered in local Colleges/Universities

Overview of impact:

				
	Medium	Medium	Medium	High
	Medium	High	High	Medium
	Low	High	High	High
	Low	Low	Medium	High

*Want to know more about
electronic commerce (e-commerce)*

- (2017) Small business incubator works to get entrepreneurs off the ground in Gary's Miller neighborhood.
- (2018) Next Level Indiana Trust Fund (\$250 million) – will begin to help provide venture capital funding for early-stage companies in Indiana (Great for Tech.)
- (2018) Hammond secured an over \$9 million tax credit for Data Center to be built at the State Line Generating Plant



State Line Generating Plant (Source: NWI Times)



2050 Plan | influences + futures

Technology

Big data

Why is this important?

The concept of Big Data is about data sets that are so large, complex, and/or rich that they cannot be analyzed using traditional tools (i.e. Microsoft Excel). In a world where there are many more streams of data being captured and many more tools and techniques available to analyze these data, understanding Big Data will be critical. With people spending ever more time online and on social media, there are also ample

more opportunities to collect data on people's preferences and behaviors, and also dangers of protecting privacy. Also, the sheer growth in the volume of data being generated far exceeds the growth in the labor force of analysts, meaning it will be critical to invest in improving the tools and techniques for analyzing Big Data lest a huge missed opportunity.

When might this make impact?

- Existing
- Trending
- Emerging
- Speculative

Big Data is already making an impact on the ecosystem of data analysis. Companies like IBM, Google, and Oracle just to name a few already invest billions of dollars annually in Big Data

analytics and in carving out competitive niches and products in order to proprietorially protect their products.

How might this impact Northwestern Indiana?

The trend toward Big Data might cause education, skills training, and other workforce development initiatives to focus more on data analytics. Instead of Indiana University Northwest and Purdue Northwest offering degrees in Computer Information Systems and Computer Science respectively, they might offer degrees in Data Analytics or Machine Learning or some more data-centric and less computer-generic programs. Jobs that









require data analysis might become more numerous in the region, and these jobs may have less active fieldwork and more work spent near computers; or these jobs might become more specialized elsewhere with less of these jobs in NW Indiana. Region planners will have a better idea of transportation system performance with a lot more information becoming useful. Government officials will understand citizen values more.

Is data / analysis needed to understand this?

Since a lot of the innovations that are coming in Big Data are in the hands of private companies, it will be necessary to follow the latest trends of the expenditure levels of each of them on Big Data and the number of products they offer in analyzing Big Data. Data on the number of degree programs and other workforce development initiatives offered in NW Indiana on Big

Data-related fields will be crucial. Examining the number of jobs and their earnings in the North American Industry Classification System (NAICS) 5415. . . code will be critical to understanding how the trend toward Big Data may be affecting jobs in the region. Also, looking at transportation performance measures such as travel time index for reliability will be important.

Overview of potential impact:

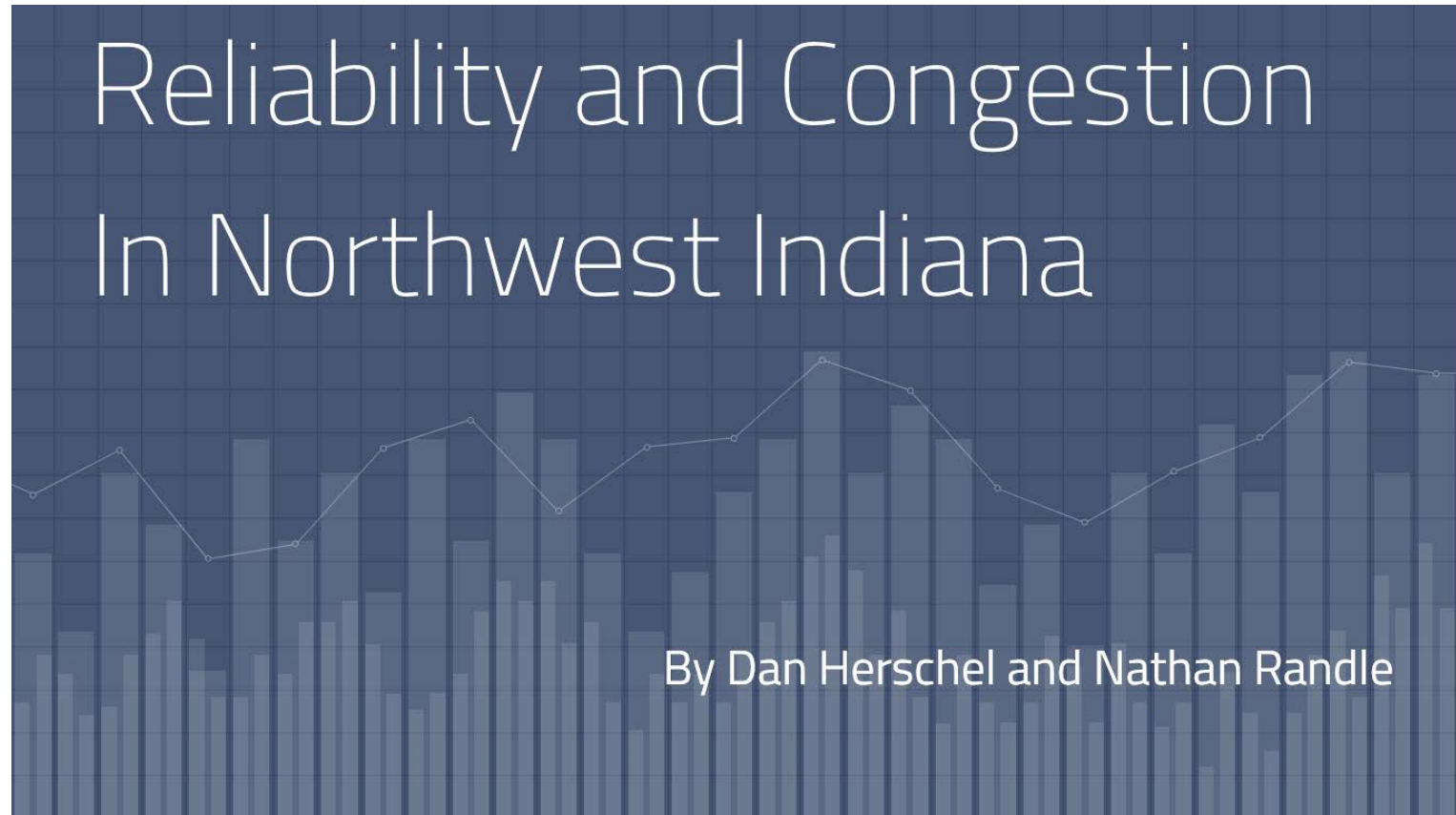
				
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	Low	Low	Low	Low
	Medium	Low	Low	Low
	Medium	High	Medium	Medium
	Medium	Low	Medium	High

*Want to know more about
Big Data?*

For a simple explanation of what Big Data means and the main points about it:
<https://www.bernardmarr.com/default.asp?contentID=766>

For the size of the Big Data analytics industry and growth predictions:
<https://www.forbes.com/sites/gilpress/2017/01/20/6-predictions-for-the-203-billion-big-data-analytics-market/#33f6e21f2083>

For job readiness in the age of Big Data:
<https://www.digitalvidya.com/blog/big-data-and-big-data-jobs-the-jobs-of-the-future-are-here/>



Reliability and Congestion Project between NIRPC and Valparaiso University Data Science Class 151, 2018

Telecommuting

Why is this important?

Telecommuting allows employees to forego the typical commute from home to work in favor of working from home or at a nearby location. Telecommuting has been around for decades in some industries, but has only more recently been prevalent in others. Telecommuting primarily relies on 3 factors in order to be successful: (1) Availability of technology, which varies by sector, for telecommuting, (2) employee access to telecommuting

technologies, and (3) employer policies that allow telecommuting. Successful telecommuting in a region such as Northwestern Indiana has the potential to alleviate traffic congestion, particularly during peak travel periods, and to potentially boost economic productivity. Alternatively, telecommuting has the potential to decrease productivity by disengaging employees from an accustomed work environment.

When might this make impact?

- Existing
- Trending
- Emerging
- Speculative

Telecommuting has existed for several decades, and in many sectors has likely peaked in maturity. Nevertheless, there could be improvements in all 3 factors mentioned above, particularly in employer policies that allow telecommuting, that would increase

its impact. No matter how much each of the 3 factors improve to make telecommuting more favorable, there will always be an element of human nature that prefers face-to-face interaction, especially in some essential tasks such as meeting new clients.

How might this impact Northwestern Indiana?

Telecommuting is primarily valuable in reducing peak period congestion, and this already has some impact in Northwestern Indiana, but has the potential to make a larger impact. A sizeable portion of Northwestern Indiana's workforce commutes to Chicago for jobs, and even telecommuting some days has the potential to significantly improve peak period congestion. On the









other hand, a significant portion of Northwestern Indiana's workforce is employed in manufacturing jobs, which do not lend themselves as well to telecommuting as more white-collar professional service jobs. More telecommuting also helps reduce some of the negative externalities associated with driving to work, such as air pollution and negative health outcomes.

Is data / analysis needed to understand this?

Data on the number of telecommuters (work from home), which are readily available from the U.S. Census Bureau would be a good starting point for understanding telecommuting. Data on household internet access would also be useful. It would also be helpful to cross-tabulate internet access data with household socioeconomic data to determine what degree of equity concerns there are. Data on employers that allow telecommuting

would also be useful to understand telecommuting. These may have to come from employer surveys. Also, congestion measure data such as delay per capita and vehicle hours traveled would be helpful in understanding the effects of telecommuting, and to a lesser extent data on possible externalities such as emissions and health outcomes.

Overview of potential impact:

				
	Low	Medium	Low	Low
	Medium	Medium	Unknown	Medium
	Medium	Low	Medium	Low
	Low	Low	Medium	High

Want to know more about telecommuting?

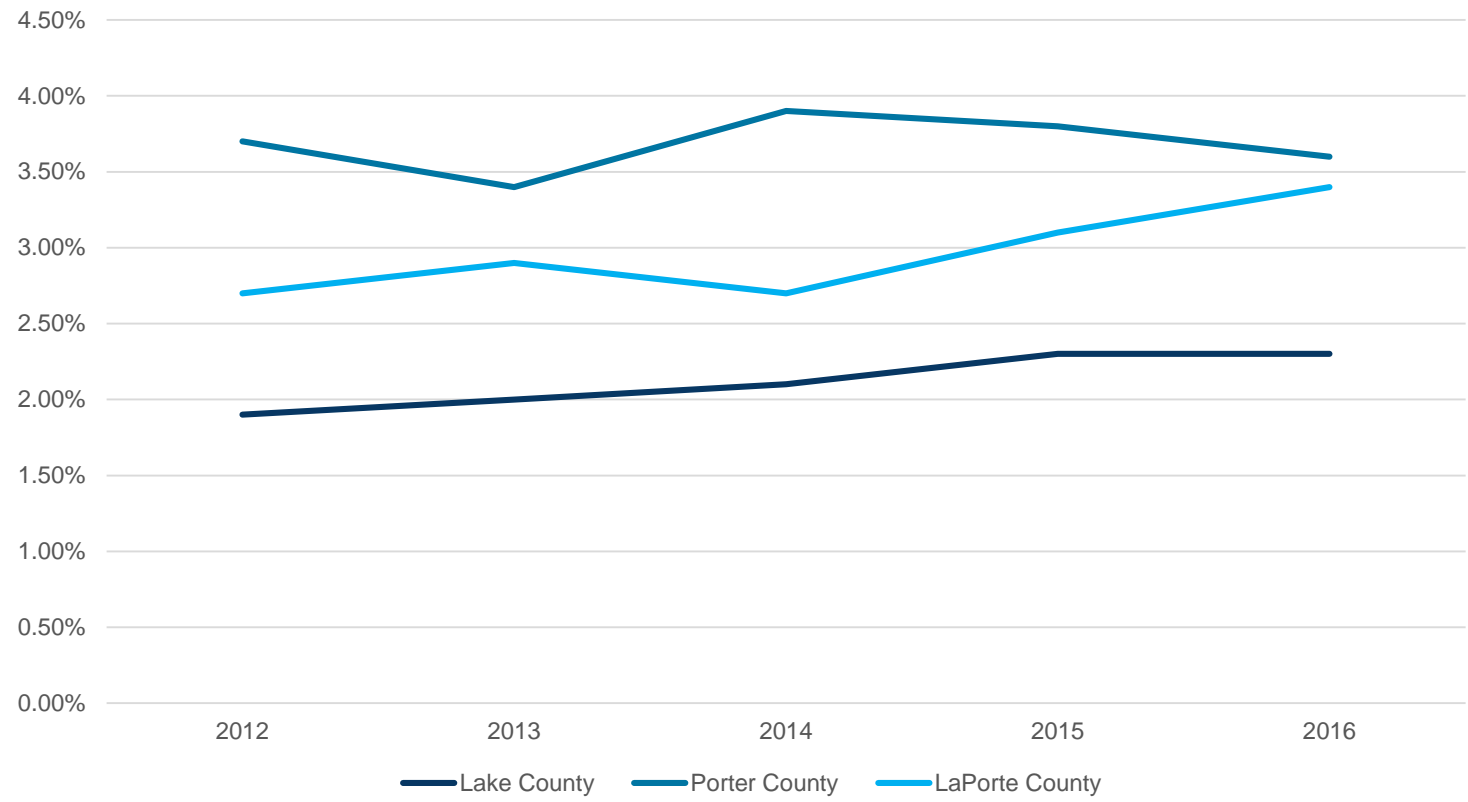
For a good general primer on telecommuting:
<https://mobility.tamu.edu/mip/strategies-pdfs/travel-options/technical-summary/telecommuting-4-pg.pdf>

For the pros and cons of telecommuting:
<https://www.thebalancecareers.com/the-pros-and-cons-of-telecommuting-what-works-for-you-2071999>

For employer benefits of offering telecommuting:
<https://www.forbes.com/sites/andrealoubier/2017/07/20/benefits-of-telecommuting-for-the-future-of-work/#4cb680d516c6>

For the environmental benefits of telecommuting:
<https://www.flexjobs.com/blog/post/telecommuting-sustainability-how-telecommuting-is-a-green-job/>

Percentage of NW Indiana Employees Working from Home, 2012-2016



Source: American Community Survey, Table S0801

Shared mobility

Why is this important?

The proliferation of smartphones and like-devices has enabled and will continue to enable people to use transportation services on an as-needed basis. This smartphone age has already spawned Transportation Network Companies (TNCs) such as Uber and Lyft that allow a user to hail a ride in served areas with a payment structure dependent on the length of the ride, time-of-day, intensity of demand, etc. Bike-sharing services and car-

sharing services also allow subscribers to use these modes without owning vehicles. Micro-transit companies that are essentially TNCs at the scale of busses are gaining ground, especially abroad. Mobility as a Service (MaaS) providers that will allow a “one-stop shop” of arranging transportation for a given itinerary across multiple modes have been on the market in international cities and will likely develop in the U.S.

When might this make impact?

- Existing
- Trending
- Emerging
- Speculative

Even if progress on developing shared mobility technologies would freeze today, their usage has already proliferated and would continue to drastically increase as consumers learn what

is already available. Uber, Lyft, bike-sharing apps like Divvy and Zagster, and car-sharing programs such as ZipCar are just some examples of existing shared mobility technologies.

How might this impact Northwestern Indiana?

There are both clear and unclear impacts to Northwestern Indiana, too many to list here. First, TNCs, micro-transit and MaaS providers will certainly increase as their services are more seamlessly integrated into the smartphone environment and more rapidly developed than public sector transit. Second, shared mobility will accelerate demographic divides such as young and old, abled and disabled. Third, it will be unclear









whether or not shared mobility will help public transit in Northwestern Indiana by solving the first-and-last mile challenges and open up transit resources to spend less on deviated services and paratransit, or whether shared mobility will compete with transit. Fourth, it will be unclear whether or not shared mobility will drive more Northwestern Indiana residents to Chicago, or whether these services will flourish in the region.

Is data / analysis needed to understand this?

Yes, the data needed to understand the trends of shared mobility are mostly housed in private sector hands. These data include smartphone application download volume and usage statistics, surveys of smartphone users as to how they use these applications, and spatial location of usage and hails of these services among others that the private sector most likely already has acquired. Transit ridership statistics, congestion statistics,

emissions, health impacts, and demographic trends that are critical to cross-tabulating with the aforementioned private sector statistics are more easily and readily obtainable in the public sector. Some of the keys to understanding the propensity to use pooled services (i.e. UberPool, LyftLine) may include sensitive cultural and demographic analysis that may not be politically palatable.

Overview of potential impact:

				
	Medium	Low	Low	Low
	High	Medium	Medium	Medium
	High	Low	High	Medium
	High	High	High	High

Want to know more about shared mobility?

Transportation Research Board (TRB) Special Report 319, accessible at <http://nap.edu/21875>, is a great resource for understanding shared mobility.

Uber coverage map available at: <https://www.uber.com/cities/nw-indiana/>

Lyft coverage map and information at: <https://www.lyft.com/rider/cities/gary-in>

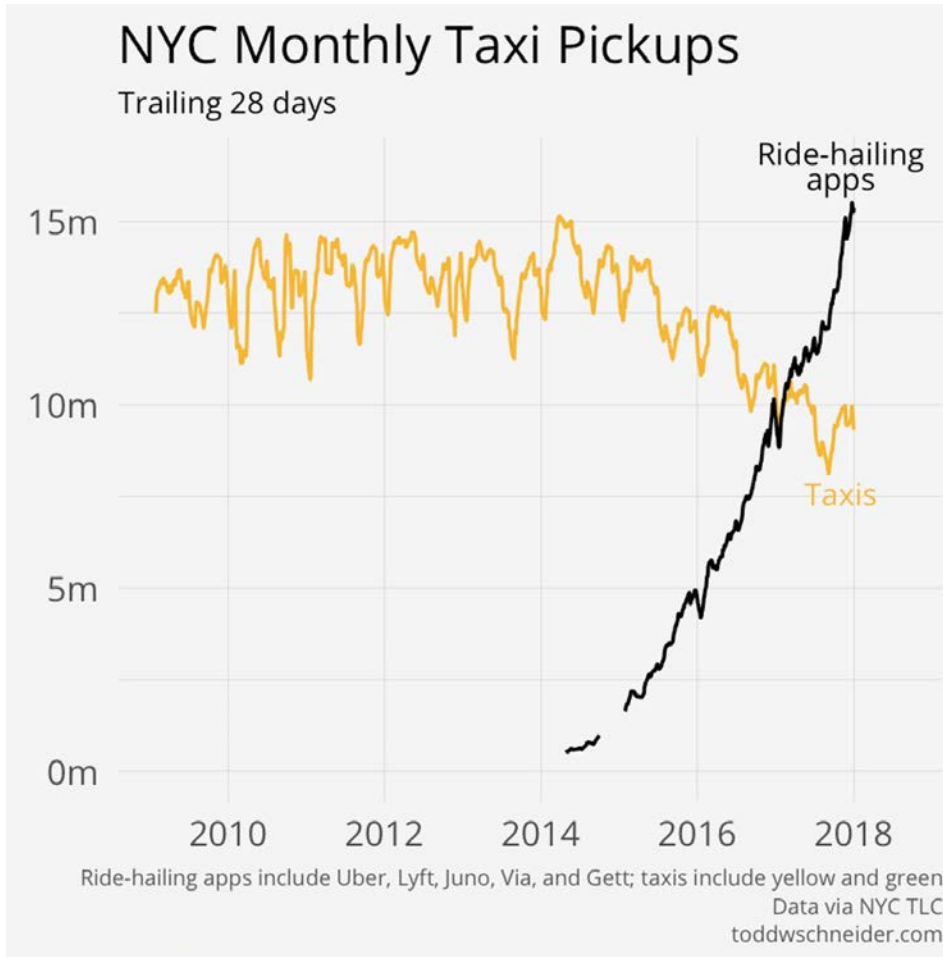
Take Bike the Streets bike-share in Gary (Zagster): <https://bike.zagster.com/gary/>

Valpo Velocity bike-share in Valparaiso (Zagster): <https://bike.zagster.com/valpo/>

Zipcar location at Valparaiso University: <https://www2.zipcar.com/>

For information on MicroTransit: <http://www.fehrandpeers.com/microtransit/>

For information on MaaS deployed in Gothenburg, Sweden: <https://research.chalmers.se/publication/204597>



New York City Monthly Taxi Pickups versus TNC Hails. The trend is even sharper in Chicago.

Source: <http://toddwschneider.com/posts/analyzing-1-1-billion-nyc-taxi-and-uber-trips-with-a-vengeance/>

Electrification and batteries

Why is this important?

As the scarcity and climate impacts of fossil fuels become clearer, and as more and more automotive companies promise entire fleet electrification, electrification is an almost certain continuing future trend. Electrification would not be possible without parallel advances in battery technologies, which continue to see billions of dollars in research and development. Consumers are also finding it easier and more convenient to

power their ever-increasing electrical devices. Smart grid technologies may soon make it possible for consumers to sell home-generated electricity such as electricity from rooftop solar panels back to the grid to make a profit. There will also be a role for the public sector to ensure that charging infrastructure exists to support the trend of electrification and batteries.

When might this make impact?



Electrification and batteries is a trend that is already set in motion because of competitive commitments from companies eager to make a profit. Volvo, General Motors, Toyota, Volkswagen, Jaguar Land Rover, and Tesla all either already

have all-electric fleets or have commitments to have all electric fleets by the mid-2020s. Charging infrastructure still lags the supply-side pace.

How might this impact Northwestern Indiana?

Vehicles may get more expensive to own as electric models often retail for more expensive prices, relying on tax credits and long-term decreased vehicle operating costs to make up the upfront price premium over time. This may force consumers to rely less on the traditional ownership model of cars and increasingly use shared mobility services and subscribe to car sharing services. Northwestern Indiana's air pollution situation

may improve, especially if trucks are electrified (or even operate with alternative fuels), since truck traffic accounts for a major portion of Northwestern Indiana's vehicular travel. More land uses will need to be reserved for charging stations, so Northwestern Indiana residents will see many more charging stations than the occasional ChargePoint stations, Kohl's parking lots, or early adopter governmental parking lots.

Is data / analysis needed to understand this?

Yes, data will be vitally important to understanding the trend of electrification and batteries. On the supply side, data on the number of commitments to all-electric vehicles will help, levels of expenditure on Research and Development in battery technologies, and percent of electrical generation coming from renewable sources versus non-renewable will be important in

understanding the trend. On the demand side, data on the prices of electric vehicles, tax credits and rebates offered for electric cars and home-generated electricity, and the price of electricity from the utilities will be important. Consumer preference surveys could identify the demographic profile of early adopters and users in general in order to pinpoint access and equity concerns.

Overview of potential impact:

<ul style="list-style-type: none"> High Medium Low Unknown 				
	Low	High	High	High
	Medium	High	Low	High
	Medium	High	Low	Medium
	Medium	Medium	High	High

**Want to know more about
Electrification and Batteries?**

For a prospectus on how electrification is the “Fourth Revolution”:
http://www3.weforum.org/docs/WEF_Future_of_Electricity_2017.pdf

For an argument of why battery technology will be critical in driving trend toward electric vehicles:
<https://www.forbes.com/sites/forbestechcouncil/2017/08/07/battery-advancements-set-to-accelerate-electric-car-adoption/#5cb1721b9153>

For trends that propel vehicle electrification:
<https://www.greentechmedia.com/articles/read/how-vehicle-electrification-will-evolve-in-2018#gs.rHaujTU>



Envision Solar EV ARC solar powered charging

SOURCE: Envision Solar

Drones

Why is this important?

Drones are changing not only the aerospace industry, but also the fundamental way humans interact with the environment. Drones offer dramatic advances in agriculture, telecommunications, media/entertainment, healthcare, urban and regional planning, and even transportation (both personal travel and deliveries) to name just a small handful of industries. The Federal Aviation Administration (FAA) estimates that drone

usage will increase 16.9% per year for hobbyists and 32.5% per year for commercial use. Improvements in safety and security as well as regulatory compliance will be critical as drone usage skyrockets. Drones promise huge benefits in efficiencies as well as impose externalities such as noise, view obstructions, privacy squabbles, and aerospace safety and congestion.

When might this make impact?



Drones undoubtedly are already growing in usage at a very rapid pace, disrupting certain industries such as agriculture and media/entertainment where they have had greatest effect. However, drones have only begun to disrupt industries such as

telecommunications, healthcare, urban and regional planning, and transportation. Global internet, almost instantly delivered prescription medicine and general e-commerce goods, and even personal transport receive hefty levels of investment in drones.

How might this impact Northwestern Indiana?

Drones may enable larger and more specialized agricultural plots of land in Northwestern Indiana as farmers are able to deploy drones to survey and work their fields and expend less costs in labor to produce a given yield. This could protect against sprawling communities in South Lake County. Drones may lower the price of telecommunications services as there could be more competition in the region (or it could raise telecommunications

prices depending on how regulation plays out). Home delivery both in medicine and in general e-commerce goods could cause there to be significantly fewer trucks on the already truck-clogged highways such as the Borman Expressway. Drone personal transport could reduce road congestion, but it could also create view obstruction squabbles over Lake Michigan (not along National Lakeshore) as commuters commute to Chicago.

Is data / analysis needed to understand this?

Data on drone ownership in NW Indiana are important and on the type of ownership – hobbyist or commercial use. Analysis on ownership should also drill down to the profile of drone owners versus non-owners to examine equity concerns. Also, labor costs and labor costs/yield are important data in agriculture. Costs of photography/videography services as well as the number and financial solvency of media outlets themselves will

be important to examine as drones become more prevalent. Costs of telecommunication services such as cellular data and internet in NW Indiana should be examined as drones penetrate the industry. Number of drone home deliveries cross-tabulated with truck counts and congestion measures will be important to understanding drone impacts on transportation, as will number of personal transport trips using drones.

Overview of potential impact:

<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	Low	Medium	Low	Medium
	High	High	Low	Medium
	High	Medium	High	Medium
	Medium	Medium	High	High

**Want to know more about
Drones?**

For possible ways drones will advance technology:
<https://www.cbinsights.com/research/drone-impact-society-uav/>

For growth forecasts in drones:
<https://www.faa.gov/news/updates/?newsId=89870>

For drone impacts in commercial delivery:
https://www.rand.org/pubs/research_briefs/RB9995.html

For drone impacts on personal transport:
<https://www.popsci.com/ehang-passenger-carrying-drone>



Drone Delivery Concept

SOURCE: Getty Images



Personal Transport drones, Ehang 184

SOURCE: Ehang

Internet of Things (IoT)

Why is this important?

The Internet of Things (IoT) is the concept of smart things communicating with each other. For example, a smart home in which the residents have installed an Amazon Echo or Google Assistant that in turn connects with smart objects like TVs, thermostats, lightbulbs, etc. would be IoT. IoT can occur in a variety of contexts: in government, the economy, residential,

transportation, healthcare, etc. In government, for example, IoT might be sensors outside of polling places that detect voter traffic and alert poll workers to prepare or relocate to where needed. IoT allows passive data collection and information flow, but it still requires some level of human input. IoT improves efficiency across all contexts.

When might this make impact?



IoT is rapidly increasing. For example, smart homes are already rapidly becoming more common, electronic toll-collection transponders are commonplace in being able to handle transactions, fitness devices are able to read vital signs and alert

the wearer to take action. But there is still a lot of potential impact of IoT that has yet to emerge such as the aforementioned government example, more advanced car parts that can detect exactly which part has a problem, etc.

How might this impact Northwestern Indiana?

IoT would greatly impact many different areas in Northwestern Indiana, but this analysis will focus on the 2050 plan focus areas: (1) the environment, (2) communities & economy, (3) mobility, and (4) people & leaders. (1) would be impacted least because by its nature the environment is fundamentally about the absence of technology. For (2), IoT would enable people and businesses to access and act upon information directly, enabling

more compact and wired communities. More emphasis will be on the rapid deployment of high-speed internet such as NITCO's Gigabit speed internet at Ameriplex in Portage in 2017. For (3), IoT would enable diagnostic information about individual vehicle parts to be relayed to a driver. IoT would also enable usage-based fees in transportation. For (4), IoT would enable government to become more efficient and responsive.

Is data / analysis needed to understand this?

Yes, data/analysis to understand IoT would include analysis in the many areas as mentioned above. For (1), number of sensors/monitors that detect environmental variables (i.e. weather stations, bacterial sensors, etc.) would be helpful. For (2), number of "smart" homes and businesses using clear criteria for "smart" would be useful. For (3), percentage of vehicles

registered in NW Indiana that have electronic tolling capability or percentage of transit riders that have access to smart payment would be very important. And for (4), number of hackathons held and number of polling places equipped with some kind of voter awareness technology would be beneficial. And across all contexts, cybersecurity would be a major concern to monitor.

Overview of potential impact:

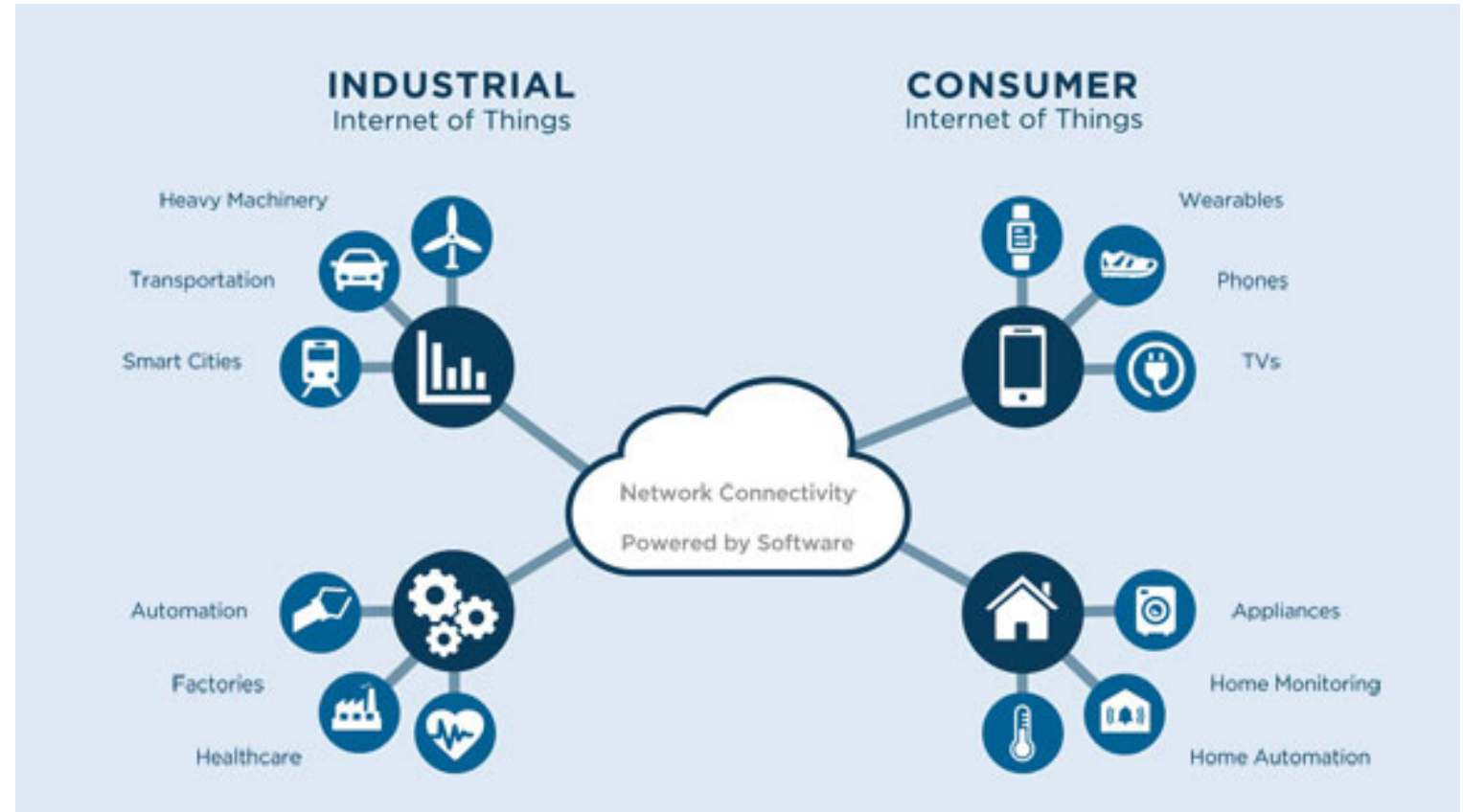
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	Low	Low	Low	Low
	High	High	High	High
	High	High	High	High
	Medium	Medium	High	High

Want to know more about Internet of Everything (IoE)?

For information on the Internet of Things (IoT) and how rapidly and in which sectors it is growing:
<https://www.statista.com/statistics/512673/worldwide-internet-of-things-market/>

For information on IoT in government:
<https://www2.deloitte.com/insights/us/en/focus/internet-of-things-government.html>

For IoT in Transportation and how CVs and AVs fit into IoT:
<https://www.digitalistmag.com/iot/2017/11/17/connected-cars-autonomous-vehicles-iot-05535120>



Internet of Things (IoT) Industrial and Consumer contexts
 SOURCE: <https://www.spindox.it/en/innovation/internet-of-things>

Internet of Everything (IoE)

Why is this important?

The Internet of Everything (IoE) is the concept of smart things everywhere communicating with each other, thus building upon the Internet of Things (IoT), which is simply the concept of smart things communicating with each other. For example, a smart home in which the residents have installed an Amazon Alexa or Google Assistant, which connects to various systems in the home would be IoT, whereas the entire network of smart homes

and how they interact would be IoE. IoE would be a whole new paradigm of exchanging information, whether the context be government, economy, transportation, etc. In government, for example, instead of citizens finding static information in the media and using this information to go vote at a ballot box for elected officials to vote, IoE would enable citizens' values and preferences to be instantly translated to policies that change.

When might this make impact?

- Existing
- Trending
- **Emerging**
- Speculative

IoT is rapidly increasing, but IoE will not develop rapidly until there is a critical mass of IoT applications. For example, smart homes are already rapidly becoming more common, but utilities are only just beginning to offer fundamentally different ways of

billing customers who have smart homes or offering smart home customers the ability to act as their own smart grids with other smart home residents.

How might this impact Northwestern Indiana?

IoE would greatly impact many different areas in Northwestern Indiana, but this analysis will focus on the 2050 plan focus areas: (1) the environment, (2) communities & economy, (3) mobility, and (4) people & leaders. (1) would be impacted least because by its nature the environment is fundamentally about the absence of technology. For (2), IoE would enable people and businesses to access and act upon information directly, enabling









more compact and wired communities. Residential businesses or command centers like the Borman Traffic Management Center, but for residences and businesses, would appear. For (3), IoE would enable diagnostic information about individual vehicle parts to be relayed to the manufacturer, which in turn route the replacement part to a nearby pickup point. For (4), IoE would require government to be more efficient and transparent.

Is data / analysis needed to understand this?

Yes, data/analysis both in terms of the inputs of IoE and the outcomes IoE enables will be valuable to understanding the success of IoE in Northwestern Indiana. On the inputs side, data on the expenditures of IoT and IoE by industry, numbers of "smart homes" and "smart businesses" in Northwestern Indiana communities, number of residences and businesses with 1 gigabit or greater internet speeds, number of government

hackathons hosted, number of vehicles equipped with IoE technologies, etc. would all be valuable. On the outputs side, data and analysis on smart grid usage, reduction in travel and shipping costs due to IoE efficiencies, government satisfaction ratings and overhead expenditure savings, resident and business satisfaction surveys with IoE, etc. would all be useful. Monitoring cybersecurity would be crucial.

Overview of potential impact:

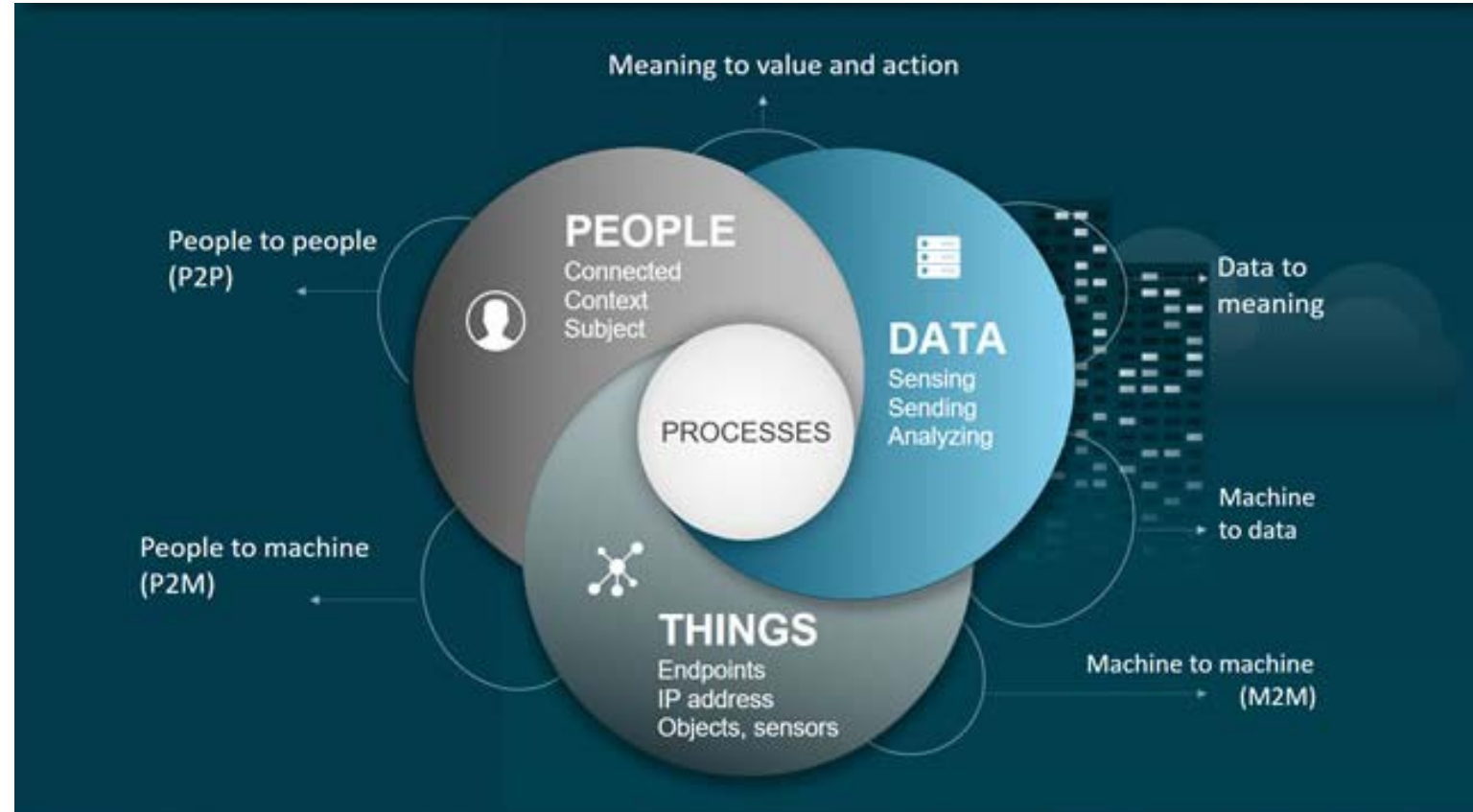
				
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
				
				
				
				

Want to know more about Internet of Everything (IoE)?

For information on the Internet of Everything (IoE) and how it is similar and different to IoT: <https://www.i-scoop.eu/internet-of-things-guide/internet-of-everything/>

For examples of how IoE can transform the flow of information into actions: <https://newsroom.cisco.com/ioe>

For how to explain the difference between IoE and IoT, and how IoE operates on 4 pillars – People, Data, Things, and Processes: https://www.huffingtonpost.com/dave-evans/cisco-beyond-things-the-interne_b_3976104.html



Internet of Everything (IoE) connection between people, data, and things

SOURCE: <https://www.i-scoop.eu/internet-of-things-guide/internet-of-everything/>

Autonomous vehicles (AVs)

Why is this important?

Autonomous Vehicles (AVs) are vehicles that are able to drive without or with only a very small degree of human input. AVs would result in safer and more efficient operation as crashes due to human operator error, accounting for well over 90% of all crashes today, would drastically decline. Congestion may be hugely affected or only minorly as capacity improves, but people's value of time decreases. Freight would have huge

implications as truck driver jobs are displaced. There are already Society of Automobile Engineers (SAE) Level 3 (on a 0-5 scale, 0 completely human controlled and 5 fully autonomous) AVs on the market today, and automakers are rapidly pilot testing many more. The transition period to AVs will be critically important to manage, as many benefits of AVs will require a critical mass of them on the roads; mixed traffic will pose many challenges.

When might this make impact?

- Existing
- Trending
- **Emerging**
- Speculative

SAE Level 3 (Audi) and Level 2 (Tesla, Mercedes-Benz, Volvo, Cadillac) AVs are already on the market. It is likely that there will be Tesla models on the market at SAE Level 4 by 2019. But, there may be relatively small impact for the near-term (0-10

years) future as a majority of vehicles will not be AVs, denting the impact of AVs. By the mid-term (10-20 years), AVs will likely be significant, perhaps equaling non-AVs, and by the long-term (20+ years), AVs will possibly become the norm.

How might this impact Northwestern Indiana?

First, the roads should be safer with AVs: less overall crashes and fewer fatalities and serious injuries. The safety targets that NIRPC adopted in support of the INDOT targets in January 2018 would be lowered. Second, congestion may decrease as capacity increases. Third, the Highway Safety Improvement Program (HSIP) in NIRPC's TIP would possibly be phased out as the safety benefits from AVs accrue. Fourth, capacity on









roads would increase as vehicles could follow more closely, and this could in turn lead to more vehicles using roads, putting more strain on maintenance needs, offsetting congestion improvements, and polluting the environment more. Fifth, absent land use controls, there would be more sprawl. Sixth, there could be equity issues and curb space access issues. Seventh, there will be transit impacts as AVs compete with transit.

Is data / analysis needed to understand this?

Given the competitive and proprietary landscape of automakers who develop AVs, there will be a need to keep up with individual automakers on their AV developments without having the benefit of a transparent clearinghouse of data. Looking at crash rates, including fatalities and serious injuries, will be critical to understanding the success or failure of AVs. Continuing to monitor congestion will also be very important in determining the

impacts of AVs. Land preservation and sprawl measures will be critical in understanding how AVs affect sprawl. Looking at the demographics of AV ownership will be important in understanding the equity issues associated with AVs. Also, looking at where the trucking, taxi and TNC-driving, and transit jobs go will be very important in assessing equity.

Overview of potential impact:

				
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
				
				
				
				

Want to know more about autonomous vehicles (AVs)?

For a strategy guide on how to incorporate AV into the Planning Process: <https://rosap.ntl.bts.gov/view/dot/31397>

For a strategy briefing document on how to incorporate AVs into the policy framework: <http://www.trb.org/Main/Blurbs/176508.aspx>

For how AVs will affect public transit: <http://www.trb.org/Main/Blurbs/176678.aspx>

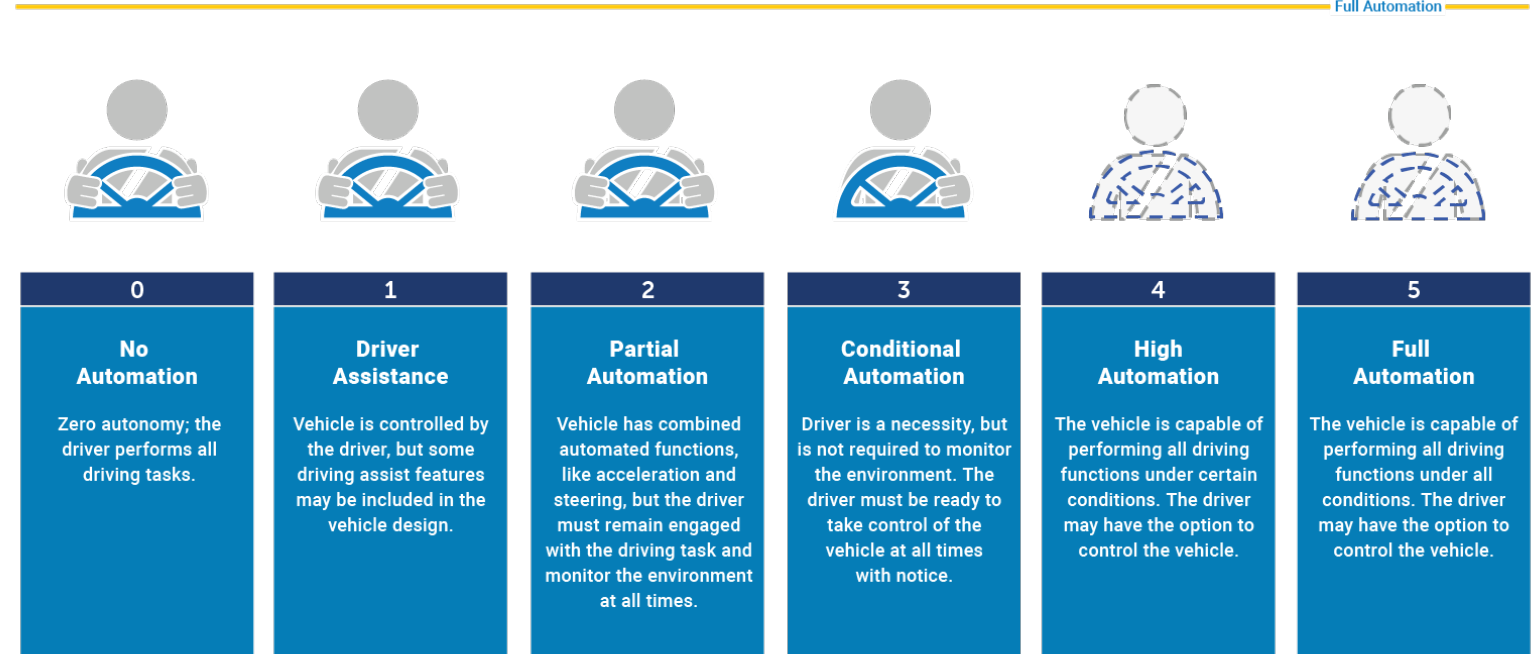
For how AVs will affect the freight industry: <http://www.trb.org/Main/Blurbs/175965.aspx>

For a comprehensive report on strategies at all levels of government to incorporate AVs into the policy framework and influence the market, see NCHRP Report 845: <http://www.trb.org/Main/Blurbs/176418.aspx>

For a forecast of AV market penetration and Americans' willingness to use AVs: https://www.caee.utexas.edu/prof/kockelman/public_html/TRB16CAVTechAdoption.pdf

For how AVs will shape land use: Aharon Kellerman, *Automated and Autonomous Spatial Mobilities: Transport, Mobilities and Spatial Change*, 2018

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS



Society of Automobile Engineers (SAE) Levels of Automation

SOURCE: NHTSA, 2018

Connected vehicles (CVs)

Why is this important?

Connected Vehicles (CVs) are vehicles that are connected either to each other (V2V), to their surrounding infrastructure (V2I) or to other things (IoT – see other report). CVs may or may not be autonomous. CVs will result in safer and more efficient operation as vehicles will be responsive to their environments. Deploying CVs will require enormous levels of investment in

upgrading vehicle fleets (predominately borne by the private sector) and our infrastructure (predominately borne by the public sector). There are some CV deployments currently on the market, and a larger number in pilot testing. But the main benefits of CVs will only accrue once a critical mass of equipped vehicles and infrastructure exists.

When might this make impact?

- Existing
- Trending
- **Emerging**
- Speculative

A very small number of CV deployments are on the market (i.e. Audi Connect and Traffic Light Information in Las Vegas, Dallas, Houston, Portland, and Washington, D.C.). However, automakers are spending far less on CVs than on autonomous vehicles (AVs). Moreover, cities, regions, and states already

face a tremendous backlog of deferred maintenance costs on their existing infrastructure, making the critical mass of infrastructure needed for CVs somewhat further off and uncertain than AVs.

How might this impact Northwestern Indiana?

First, the roads should be safer with CVs: less overall crashes and fewer fatalities and serious injuries. The safety targets that NIRPC adopted in support of the INDOT targets in January 2018 would be lowered. Second, congestion, particularly on signalized arterials, should decrease as efficiency increases. Third, a higher percentage of NIRPC's Transportation Improvement Program (TIP) would be spent on operations, with the









percentage increasing from 11% of the total FY 2018 - 2021 TIP. Fourth, capacity on roads would increase as vehicles could follow more closely and strategically time arrivals-on-green, and this could in turn lead to more vehicles using roads, putting more strain on maintenance and preservation needs as well as offset congestion improvements due to efficiency gains. Fifth, their could be unequal benefits and burdens during the transition.

Is data / analysis needed to understand this?

Given the competitive and proprietary landscape of automakers who develop CVs, there will be a need to keep up with individual automakers on their CV developments without having the benefit of a transparent clearinghouse of data. As far as the benefits of CVs are concerned, monitoring safety data through the ARIES crash database, congestion data, financial data through the

Federal Highway Administration's Financial Management Information System (FMIS), emissions data, and updating the Transportation Research Board's Highway Capacity Manual will all be important to understanding the transition to CVs. Vehicle registration data cross-tabulated with demographic information about vehicle ownership and income will also be important.

Overview of potential impact:

				
	Low	Medium	Low	Low
	Low	Low	Low	Low
	Medium	Low	Low	Low
	Medium	High	High	High

**Want to know more about
connected vehicles (CVs)?**

For basic information on how CVs will personally affect you:
https://www.its.dot.gov/cv_basics/index.htm

For a strategy guide on how to incorporate CVs into the
Planning Process: <https://rosap.nntl.bts.gov/view/dot/31397>

For examples of planning for CVs and takeaways from those
examples: <http://www.ampo.org/wp-content/uploads/2017/12/CV-Pilots.pdf>

For a strategy briefing document on how to incorporate CVs
into the policy framework:
<http://www.trb.org/Main/Blurbs/176508.aspx>

For a comprehensive report on strategies at all levels of
government to incorporate CVs into the policy framework and
influence the market, see NCHRP Report 845:
<http://www.trb.org/Main/Blurbs/176418.aspx>



Audi Traffic Light Information in Washington, D.C.

SOURCE: *The Verge*, 2018

3D printing

Why is this important?

3D printing, the ability for a user to print a 3D object from an ever-increasing universe of possible designs, has already hit the market, but it has the ability to make many more potential impacts. There could be many disruptions in the consumer goods and manufacturing industries. So far 3D printing has mainly focused on prototyping or niche hobbyist materials, but mass-market consumer good and manufacturing use may not

that far away. Consumers could be able to print everyday necessity goods without having to either shop for them or use e-commerce. 3D printing may either negatively impact the manufacturing industry by displacing jobs, or it could complement manufacturing with more and higher-paying jobs. 3D printing could also greatly affect the medical industry by enabling patients to print potentially lifesaving devices.

When might this make impact?

- Existing
- Trending
- **Emerging**
- Speculative

While 3D printing has been used for prototyping and hobbyist materials for several years, its pace toward disrupting the consumer goods and manufacturing sectors seems slow.

Nevertheless, in the 15-year plus timeframe, 3D printing could reshape the consumer goods landscape and massively reshape manufacturing.

How might this impact Northwestern Indiana?

Northwestern Indiana is perhaps exposed to a greater risk of disruption from 3D printing than most regions. Since Northwestern Indiana is on the fringe of the Greater Chicago area, most of the cutting edge retail and e-commerce delivery infrastructure would likely not reach Northwestern Indiana as early, creating a gap perhaps for 3D printing to fill. Also, Northwestern Indiana has a lot of manufacturing jobs, meaning









disruption, good or bad, could be felt. In sum, 3D printing could cause there to be noticeably less retail, less freight vehicles on the region's highways and rails, and fewer manufacturing jobs. Manufacturing jobs could be higher paying (offsetting job loss), health outcomes could improve as patients are able to print medical devices instead of travel, and environmental benefits could be felt with less overall travel. Even food could be printed.

Is data / analysis needed to understand this?

Since a lot of useful data/analysis about 3D printing is held by private companies, it will be necessary to closely monitor those companies and industry trends. The kinds of data that would be useful include number of 3D printers bought and sold, surveyed access to a 3D printer, number of manufacturing jobs, number of startups and entrepreneurs (who use disproportionately more 3D

printing), number of home-based shopping and home-based medical trips, and number of e-commerce deliveries among many others. Also, salary and wage information on industries such as manufacturing that use 3D printing would be important to determine the overall impact of 3D printing on manufacturing.

Overview of potential impact:

				
	Low	Medium	Low	Medium
	Medium	Medium	Low	High
	Medium	High	Low	High
	Low	Low	High	High

**Want to know more about
3D printing?**

For information about where the 3D printing may be heading:
<https://www.manufacturingtomorrow.com/article/2018/01/the-future-of-3d-printing/10820/>

For information on how 3D printing is changing manufacturing:
<https://www.manufacturingtomorrow.com/article/2018/03/how-3d-printing-is-impacting-manufacturing/11190>

For information on how 3D printing is changing healthcare:
<https://techcrunch.com/2018/04/05/bioprinted-organs-skin-and-drugs-how-3d-printing-is-revolutionizing-healthcare-as-we-know-it/>



3D Printer

SOURCE: MakerBot

Artificial Intelligence (AI)

Why is this important?

Artificial Intelligence (AI) is the concept of machines possessing intelligence apart from human intelligence. Clearly, AI requires an initial input of human intelligence to create the machine capable of AI. However, at some point the machine gains the ability to learn and eventually operate without or with minimal human intelligence. Often thought of as the same as robotics, AI is actually broader, encompassing anything from language

recognition algorithms which route a customer to the correct department to fully autonomous robots. AI is already used in many fields such as business, healthcare, entertainment, and even transportation. Researchers estimate that AI will be required in order to achieve a fully autonomous vehicle at Society of Automobile Engineers (SAE) level 5 automation.

When might this make impact?

- Existing
- Trending
- **Emerging**
- Speculative

AI is starting to make impacts in fields such as business, where natural language processing (NLP) helps route customer requests to correct departments. Also, in entertainment, AI has been used extensively in video games. In transportation, AI has

begun to be used, mostly in pilot tests for autonomous vehicles. But in other fields, such as healthcare, legal, and government, AI has not nearly caused its potential impacts.

How might this impact Northwestern Indiana?

If AI fully realizes its potential impact in Northwestern Indiana, there could be profound impacts. Rather than taking time to either shop for consumer goods or even spend time on e-commerce sites, consumers could subscribe to services that would deliver goods to their smart homes. Doctors and healthcare providers could diagnose conditions and issue patients medicine without face-to-face interaction. Legal advice









seekers would be able to get legal documents and advice without talking to lawyers. Autonomous vehicles (AVs) could navigate the region's roads and highways and engage in lane-changing behaviors in-line with programmed preferences of the occupants. Government could become more efficient without politicians to meet citizens' preferences. Across all sectors, jobs could be massively displaced.

Is data / analysis needed to understand this?

Yes, data on AI will be largely difficult to obtain because of its competitive proprietary nature. Nevertheless, by tuning into companies that produce AI, analysts should focus on number of patents, processing times, market penetration rates of AI across various sectors, and ownership rates in the consumer and transportation sectors. Demographic data will be helpful to determine what access and equity issues AI presents. Customer

satisfaction surveys will be helpful in determining how favorably customers view AI. Safety data will be crucial in understanding how much a safety benefit (or threat) AI poses. Cybersecurity monitoring will be extremely important, and there will need to be safeguards in place in the event of rogue AI. Employment data will be important in understanding how AI affects the job market.

Overview of potential impact:

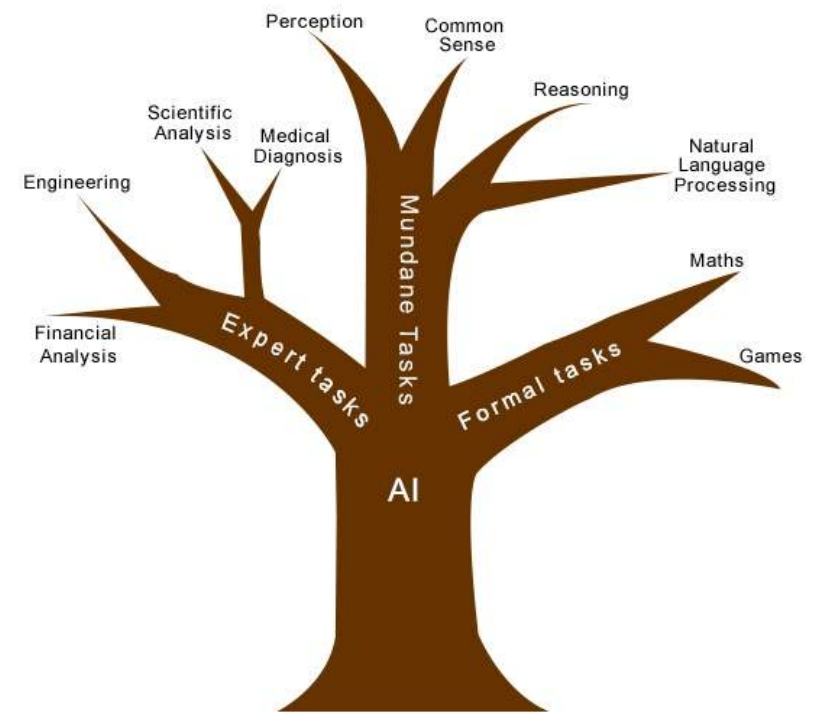
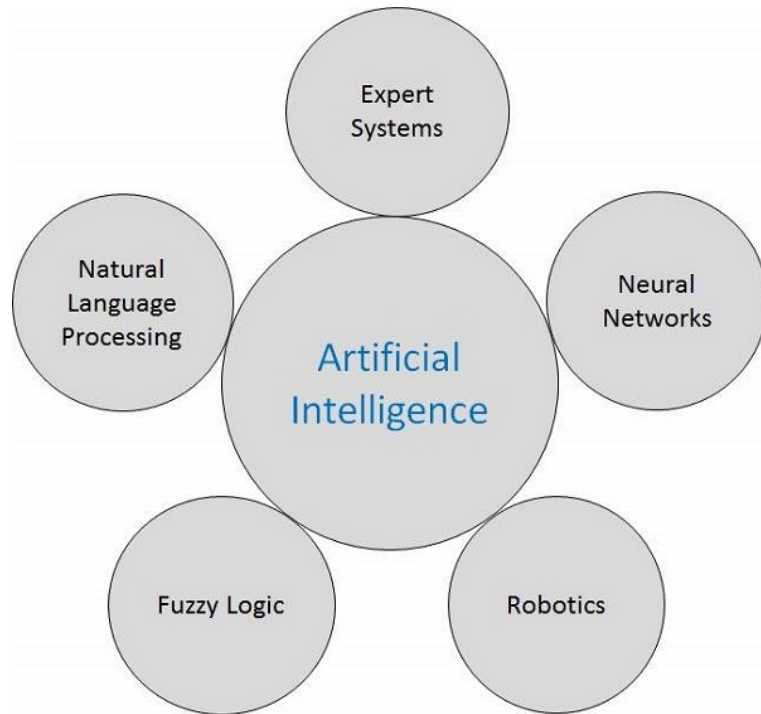
				
	Low	Low	Low	Low
	Low	Low	Medium	High
	High	High	High	High
	Low	Medium	High	High

Want to know more about artificial intelligence?

For broad information on AI and the types of AI:
<https://www.techopedia.com/definition/190/artificial-intelligence-ai>

For an overview of AI and what its benefits and risks are:
<https://futureoflife.org/background/benefits-risks-of-artificial-intelligence/>

For possible job impacts from AI:
<https://www.theguardian.com/technology/2018/jul/17/artificial-intelligence-will-be-net-uk-jobs-creator-finds-report>



Approaches and types of Artificial Intelligence (AI) as well as the tasks AI can accomplish

Sources: <https://www.javatpoint.com/artificial-intelligence-research-areas>, <https://becominghuman.ai/what-is-artificial-intelligence-ai-4bde325e5462>

Hyperloops

Why is this important?

Hyperloops, popularized by the ideas of Elon Musk of SpaceX and Tesla, are basically pods traveling through vacuum-sealed tubes used to transport people or freight. An analogy would be the pneumatic tubes used at drive-through banks that transport money between tellers and drivers, but at a much larger scale. Hyperloops could dramatically decrease travel times along the few (unless their costs decrease dramatically) corridors along

which they are built, even much more than air travel and high-speed rail. Also, because their costs are so high and needs for other seemingly more practical infrastructure so great, hyperloops would likely be financed predominately by the private sector. Whether hyperloops are a passing fad or a staying trend remains to be seen, but they are getting a lot of attention from the private sector and even federal grants.

When might this make impact?



Hyperloops were not even conceptualized until 2012 with the I-5 Corridor in California, and only in the past few years has any funding gone into their development, so potential impacts are

likely somewhat distant (10-years plus). Any impact will probably be much earlier in high-demand corridors outside of Northwestern Indiana such as California and the East Coast.

How might this impact Northwestern Indiana?

The company Hyperloop One awarded the Mid-Ohio Regional Planning Commission (MORPC) \$2.5 million to develop plans for a Chicago-Columbus-Pittsburgh hyperloop corridor. Northeast Ohio Areawide Coordinating Agency (NOACA) is also developing a Chicago-Cleveland corridor. Northwestern Indiana would be served. While it is extremely unlikely that there will be any stops or entry points in the region, region residents would

not have far to travel to Chicago and onward to Columbus, Pittsburgh, or Cleveland in still far less time than other options. If hyperloops in general become cost-effective and develop within Northwestern Indiana, there could be many effects. There are many possible negative impacts including equity concerns, environmental concerns, aesthetic and noise concerns, etc. that will have to be addressed before hyperloops become feasible.

Is data / analysis needed to understand this?

Yes. Costs are very important to understand hyperloops including costs per mile, costs per trip, and the trends in costs over time. Also, capacity of hyperloops will need to be understood in order to gauge whether or not they can feasibly compete with other modes. Socioeconomic data about the users of hyperloops will be important to understand the question, even

if hyperloops become a feasible travel option, would hyperloops be accessible to most people? Also, data on the environmental impacts such as water table impacts, soil displacement, seismic activity will need to be carefully monitored.

Overview of potential impact:

<ul style="list-style-type: none"> High Medium Low Unknown 				
	Medium	High	Medium	Medium
	High	High	Medium	Medium
	High	Medium	Medium	High
	High	High	High	High

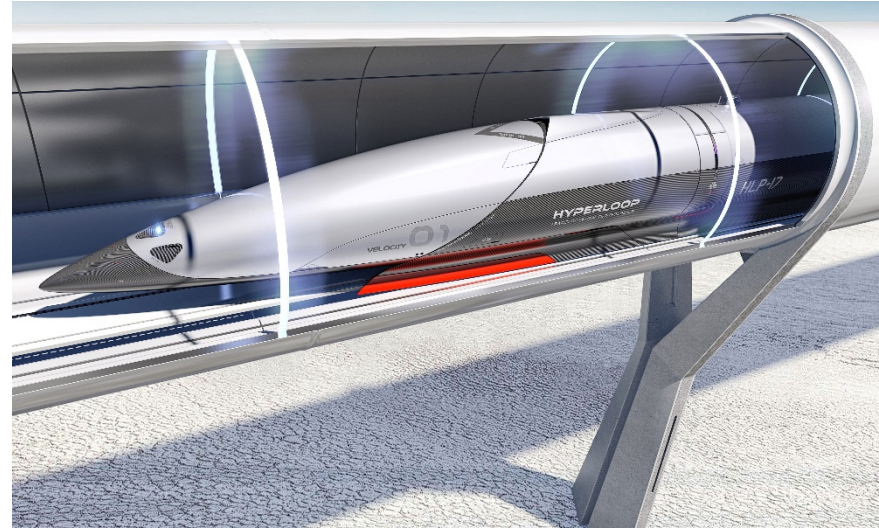
Want to know more about Hyperloops?

For an overview of hyperloops and their impacts:
<https://www.zdnet.com/article/what-is-hyperloop-everything-you-need-to-know-about-the-future-of-transport/>

For a more detailed report about the commercial feasibility of hyperloops:
https://rosap.ntl.bts.gov/view/dot/12308/dot_12308_DS1.pdf

For information on the potential role of hyperloops in transportation: <http://www.pitt.edu/~blr58/IMG/wa3.pdf>

For information on the Chicago-Columbus-Pittsburgh hyperloop:
<https://chicagotonight.wttw.com/2018/05/24/chicago-pittsburgh-45-minutes-look-high-speed-hyperloop>



Hyperloop design example

Source: PriestmanGoode



Hyperloop interior design example

Source: BMW Designworks

Genetic engineering

Why is this important?

Genetic engineering allows humans to design other living organisms, potentially even other humans, to have characteristics deemed desirable. Since genetic engineering is already used extensively in agriculture and medical testing, this report focuses on the potential of genetic engineering applied to other humans and animals. The idea that parents could design their “children” to have certain traits that parents deem desirable

could upend usual demographic structure and constraint, not to mention eradicate many diseases. Likewise, the idea that humans could design the animals around them to have desirable traits could have major impacts like lessening disease transmission, increased bonding with pets and all the ancillary benefits that entails, and preservation of intrinsic value certain animal viewing experiences give humans.

When might this make impact?

- Existing
- Trending
- Emerging
- **Speculative**

Advances are rapidly increasing in understanding DNA and genetics including gene therapy that has already reached clinical practice in some cases, but the time when parents will be able to genetically determine their “children” probably remains a speculation. First, there are major ethical debates that are

unresolved. Second, even if ethical barriers are cleared and funding pours in, the understanding of technology to not only produce DNA transcription proteins but embryonically implant them is probably somewhat distant.

How might this impact Northwestern Indiana?









There are so many different speculative possibilities for how genetic engineering would impact Northwestern Indiana depending on the degree to which regulation allows it, but there are sure impacts that span the possibilities. These impacts include disease prevention and possibly eradication, loss of natural population diversity, reduction in mortality rates, change in humans’ interaction with nature, and a change in the

employment in the healthcare and scientific fields. Instead of babies being born at hospitals delivered by nurses, parents would perhaps shop for their “children” at science labs with scientific counselors to assist them. Genetic engineering could reduce the land consumed by hospitals and increase the land consumed by science labs. Genetic engineering could lead to more tourism at spaces like the Indiana Dunes to see animals.

Is data / analysis needed to understand this?

Yes data on expenditures of funding research in genetic engineering would be useful to monitor. Policies that allow or prevent genetic engineering should also be monitored.

Overview of potential impact:

				
<ul style="list-style-type: none"> ● High ● Medium ● Low ● Unknown 				
	Low	Low	Low	High
	Low	Low	High	High
	High	High	High	High
	Low	Low	Medium	Medium

Want to know more about genetic engineering?

For information on genetic engineering and some of the ethical dilemmas it presents:

https://www.washingtonpost.com/news/in-theory/wp/2016/02/22/whats-the-difference-between-genetic-engineering-and-eugenics/?utm_term=.6e29d591e6e3



Source: Getty Images

Geoengineering

Why is this important?

Geoengineering, the concept of humans altering the physical environment in order to acquire characteristics deemed desirable, could literally reshape Northwestern Indiana. Geoengineering could allow humans to mitigate the risks of Climate Change by offering technological solutions to reducing its impacts rather than cutting Greenhouse Gas emissions.

Leaders on the global scale could decide to use geoengineering where Northwestern Indiana leaders may have little input, yet still feel the effects. However, Northwestern Indiana leaders could implement geoengineering approaches on a regional or even local scale, creating microclimates to their desired characteristics.

When might this make impact?



Geoengineering is likely a distant technology with little realistic threat of making an impact in the short to medium term. There are numerous yet unknown technologies that could be a part of a geoengineering strategy such as cloud seeding. Likewise, the

costs involved in technologies such as space mirrors or cloud seeding would likely be very high, creating a lot of opposition. Finally, there could be ethical barriers to humans' reshaping the Earth.

How might this impact Northwestern Indiana?

If Climate Change is the impetus for justifying geoengineering technologies, it is likely that geoengineering would cool, perhaps significantly, the climate in all areas around the globe including in Northwestern Indiana. This would result in shorter or no longer-increasing, growing seasons, and a shorter or no longer-lengthening tourism season. If lengthening the summer tourism

season or preventing weather-driven outmigration is the impetus for regional or local geoengineering techniques, then geoengineering would have the opposite effects: longer growing seasons, longer summer tourism seasons, and perhaps greater and older population.

Is data / analysis needed to understand this?

Yes, costs on geoengineering techniques will be very important to understanding its feasibility and impacts. Public opinion on its ethics will also be important. The effect of actual warming or cooling change per dollar spent on certain geoengineering techniques will be very important in understanding the feasibility of each of the techniques.

Overview of potential impact:

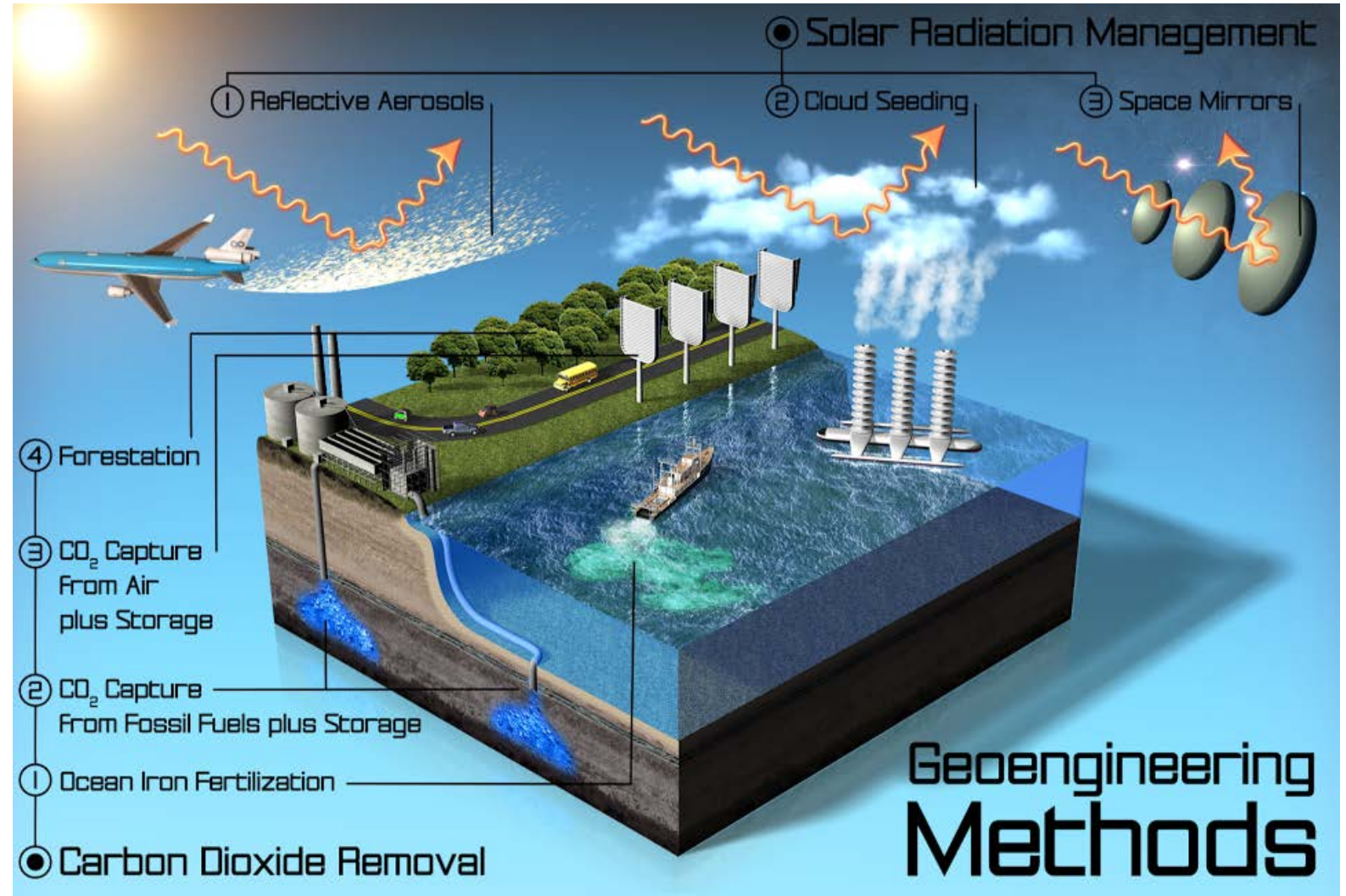
	High	High	High	High
	Low	High	Low	High
	High	High	Medium	High
	Low	Low	Low	Low

Want to know more about geoengineering?

For an overview of geoengineering:
<https://futurism.com/climate-change-geoengineering/>

For how geoengineering can help mitigate the effects of climate change:
<https://www.technologyreview.com/s/604081/the-growing-case-for-geoengineering/>

For some of the legal concerns about geoengineering:
<https://www.scientificamerican.com/article/world-needs-to-set-rules-for-geoengineering-experiments-experts-say/>



Geoengineering Concepts

Source: IPCC / Royal Society