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Issue Overview

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Preparing for Climate Change in Illinois: An Overview of Anticipated Impacts

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Climate change is projected to wreak havoc on islands and coastal places due to rising sea levels. But places like Illinois will not be spared, and Illinois policymakers would be well advised to start considering the impact climate change will have in the state.

Warmer summer temperatures will increase the rate at which local air pollutants like hydrocarbons and nitrous oxides combine with summer sunlight to form ozone—an important contributor to asthma, bronchitis, and other respiratory diseases. More health issues will mean greater need to care for those affected. The higher temperatures will mean more demand for energy. Heat stress will also affect livestock and crops. Moreover, climate change will increase storm severity and lead to more of both droughts and floods in Illinois. More intense storms and longer droughts mean property and crop insurance costs will rise. They also mean growing seasons and growing patterns could change, and that could affect how and when crops move to market.

Is Illinois ready for all of this? Some steps have been taken. The Illinois Climate Change Advisory Group made a set of recommendations to the governor in 2007.[1] The ad hoc Chicago Climate Task Force created the Chicago Climate Action Plan in 2007,[2] and released a progress report in 2010.[3] These initiatives represent progress that should continue to be evaluated.

Illinois may be able to reduce the negative consequences of climate change by preparing now for heat-related health crises and higher electricity costs. We can improve storm management infrastructure, work with farmers to help make necessary adjustments to agriculture, and enable insurance markets to protect Illinois residents. State government will have a significant role to play in this process.

In this issue overview, we explore problems that will likely face Illinois policymakers and voters in years to come. First, we look at the likely changes to Illinois' climate, and then explain some of the implications of these changes. In particular, we highlight the greater demand for electricity, increases in heat-related deaths and illnesses, higher cost of flood and crop insurance, changes in agricultural production patterns, and opportunities for investment in transportation and water resources infrastructure.

What will Illinois' climate be like in coming decades?

Scientists have spent significant time and resources developing computer models to predict future global temperatures, precipitation, and other changes in Earth's climate. To assess and summarize all those research results, the United Nations and World Health Organization organized the Intergovernmental Panel on Climate Change (IPCC) to produce a three-volume assessment report every few years. The Fifth Assessment Report (2014) summarizes a variety of projections from different researchers. It demonstrates that climate change is not uniform. Some areas are getting hotter than others, while some areas are less affected, or even cooler. Some parts of the world are becoming drier, while others are getting wetter.

As a benchmark for comparison, Table 1 shows the historical average temperature and precipitation in Illinois for each season of the year and overall. The annual average of 52°F might seem low, but this figure averages over all daytime highs and nighttime lows. For example, the average summer temperature of 73°F includes daytime highs in the 80's and nighttime lows in the 60's.

[1]Recommendations of the Illinois Climate Change Advisory Group are available at http://www.epa.illinois.gov/topics/air-quality/planning-reporting/climate-change/recommendations/index

[2]The Chicago Climate Action Plan is available at http://www.chicagoclimateaction.org/filebin/pdf/finalreport/CCAPREPORTFINALv2.pdf

[3]The Chicago Climate Action Plan progress report is available at http://www.chicagoclimateaction.org/filebin/pdf/CCAPProgressReportv3.pdf

Table 1: Normal Average Temperature and Precipitation in Illinois

Season	Temperature (degrees F)	Precipitation (inches)
Winter	29.0	6.97
Spring	52.0	11.40
Summer	73.5	11.85
Fall	54.2	9.97
Annual	52.2	40.20

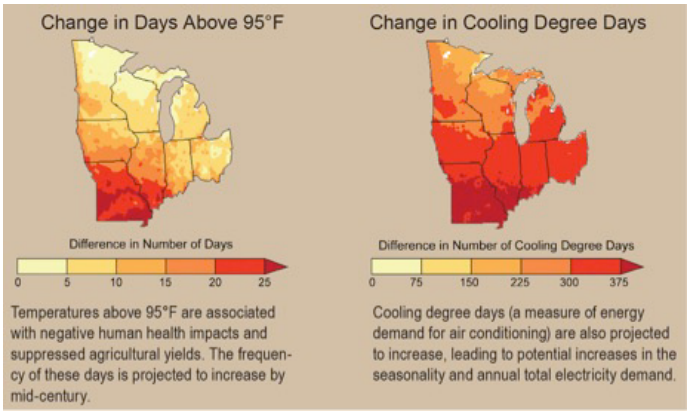
Source: Illinois State Water Survey, State Climatologist Office for Illinois, Prairie Research Institute, available at: http://www.isws.illinois.edu/atmos/statecli/general/averages.htm

Without significant action to reduce carbon emissions, the IPCC projects eventual increases in average global temperature of at least 5°F and possibly 10°F. More important, however, is the variability in temperatures and extreme weather events. For example, Illinoisans would be less adversely affected by an increase in average summer temperature from 73°F to 78°F, or even 83°F, than by an increase in the number of hot summer days that exceed 95°F. Likewise, increases in rainfall are more damaging if the rain comes in concentrated downpours.

To focus on effects within the U.S. and Illinois, Figure 1 borrows two maps from *Climate Change Impacts in the United States: The Third National Climate Assessment*, produced by the U.S. Global Change Research Program (page 74).[4] The first map shows that by the middle of this century (2041-2070), most of Illinois will experience ten or more additional days each year with temperatures over 95°F. This would more than double the number of current days each year that exceed 95°F. In fact, the average Chicagoan is likely to experience more days above 95°F by mid-century than the average Texan does today. The report predicts this increase would have a significant impact on Illinois agriculture, with a "15 percent likely average yield loss in the next five to 25 years, and up to a 73 percent likely average yield loss by the end of the century."[5]

The second map in Figure 1 shows the projected change in the number of "cooling degree days," a measure of electricity demand for air conditioning. Assuming that a day with 65°F would require no air conditioning, this measure takes each day's average temperature minus 65°F (so a day that averages 80°F has 15 "cooling degrees" that day). It then adds that difference over all days of the year. This map shows that most of Illinois will experience an additional 300 cooling degree-days per year by mid-century—the equivalent of 30

Figure 1: Projected Climate Change in the Midwest



Projections in Figure 1 are from global climate models are shown for 2041-2070 as compared to 1971-2000, under an emissions scenario that assumes continued increases in greenhouse gasses. Source: Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. (2014). Highlights of Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, Washington, DC. Available at http://nca2014.globalchange.gov/.

days in the summer that are each an extra 10°F warmer. The implication is not just additional demand for electricity for air conditioning, but more cases of heat stroke for those without air conditioning. On the other hand, winter days might also become warmer, reducing the demand for home heating. Warmer winters might also reduce certain health problems caused by the cold.

The strong scientific consensus is that temperatures will rise as concentrations of greenhouse gases in the atmosphere cause the climate to change. However, significant uncertainty remains about where and when temperatures will change the most, how much they will change, and what the effects will be. Climate models display a range of predicted temperature results due to uncertainty about how future socio-economic variables affect emissions, how emissions affect concentrations in the atmosphere, and then how concentrations affect climate. There are significant questions about how changing temperatures will affect energy demand, human health, agricultural productivity, and sea levels.[6]

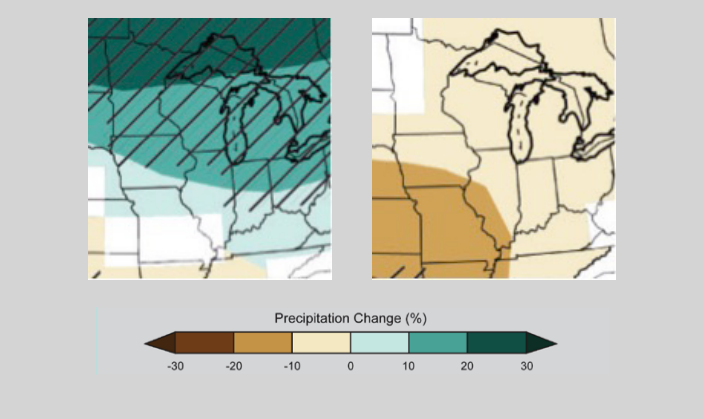
Less understood than temperature, and therefore even more uncertain, are the specific effects of climate change on rainfall, storm damage, floods, and droughts. To provide some idea of the most likely effects in Illinois, Figure 2 displays two maps from Melillo *et al* (2014, page 29). The first shows that spring rainfall in Illinois will likely increase by 0-10 percent in central Illinois and by 10-20 percent in northern Illinois. These extra downpours will likely disrupt the planting season. Flooding can ruin previous seeding efforts and delay seeding more generally. The second map shows that summer rainfall will likely decrease by 0-20 percent during the crop-growing season, when rain is most needed. In other words, the increased rain in spring and decreased rain in

[4]Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. (2014). Highlights of *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, Washington, DC. Available at http://nca2014.globalchange.gov/.

[5]Gordon, Kate, et al. (2014). Risky Business: The Economic Risks of Climate Change in the United States. A Product of the Risky Business Project, co-chaired by Michael Bloomberg, Henry M. Paulson, Jr., and Thomas F. Steyer, available at http://riskybusiness.org/.

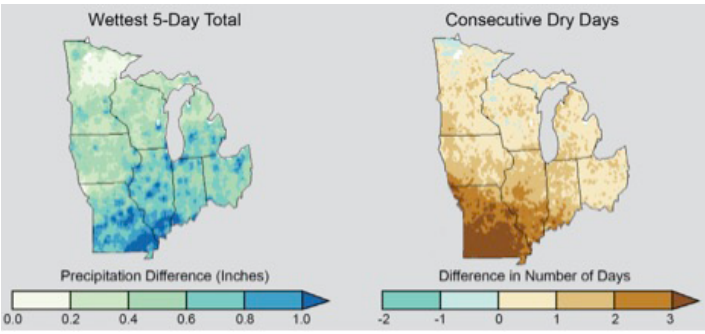
[6]Attanavich, W., B.A. McCarl, Z. Ahmedov, S.W. Fuller and D.V. Vedenov. (2013). Effects of climate change on US grain transport. *Nature Climate Change*, 3, 638-643.

Figure 2: Illinois May Experience More Rain in Spring and Less Rain in Summer (percentage change in average seasonal precipitation in 2071-2099 relative to 1970-1999 for Scenario A2)



Source: Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. (2014). Highlights of Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, Washington, DC. Available at http://nca2014.globalchange.gov/. These maps are from page 29.

Figure 3: More Rain during Wet Periods and Longer Dry Periods (projected changes for 2041-2070 relative to 1971-2000 under continued emissions, A2 scenario)

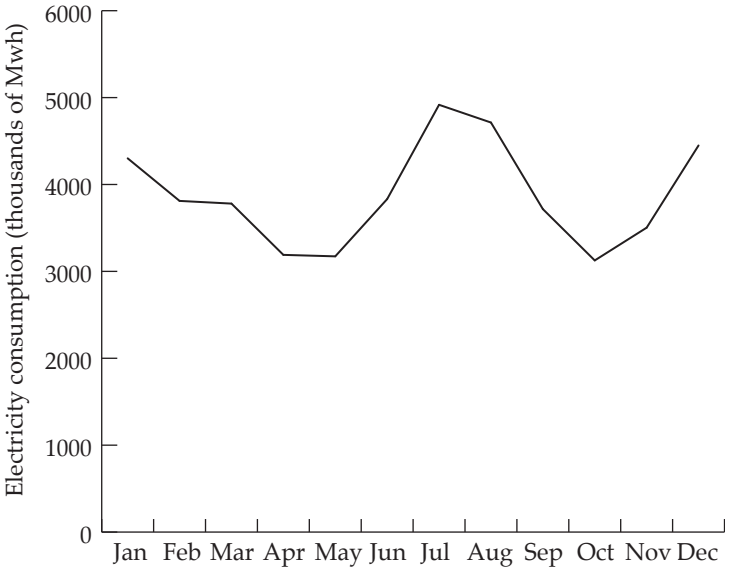


Source: Pryor, S. C., D. Scavia, C. Downer, M. Gaden, L. Iverson, R. Nordstrom, J. Patz, and G. P. Robertson. (2014). Chapter 18: Mid¬west. In Climate Change Impacts in the United States: The Third National Climate Assessment. J. M. Melillo, Terese (T.C.) Rich¬mond, and G. W. Yohe, Eds. U.S. Global Change Research Program. 418-440. doi:10.7930/J0J1012N.

summer would both be bad for Illinois agriculture.

Finally, consider predicted changes in flooding and associated storm-water management problems in urban areas such as in Chicago, and potential water shortages in towns around the rest of the state. Figure 3 shows that the wettest five-day period each year in Illinois is likely to include about one inch more of rain than it did before. It also shows that the driest period of the year in Illinois is likely to be one to three days longer than before. In other words, climate change will mean both heavier floods and longer dry periods.

Figure 4: Illinois Monthly Retail Electricity Consumption in 2013 (under continued emissions, A2 scenario)



Source: http://www.eia.gov/electricity/data/eia826/

What are the implications of a changing climate in Illinois?

Rising demand for electricity

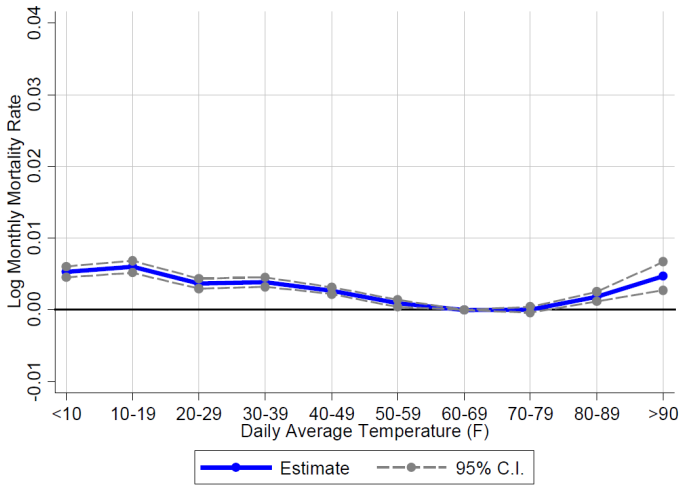
One of the largest and most pervasive impacts of climate change in Illinois will be a significantly increased demand for electricity. In particular, for this resource, it is peak electricity demand that drives prices and infrastructure needs.

Air conditioning is responsible for a significant portion of Illinois' electricity consumption and electricity demand peaks in July, when people use air conditioning the most (see Figure 4). This peak will be even higher and last longer if summers become hotter, straining the electric power system and increasing the price of electricity. This, in turn, could require the construction of new electric power plants. To address this issue, Illinois policymakers can take steps to reduce summer demand, and electricity usage generally, by encouraging the use of smart meters.

Increased heat-related illness and deaths

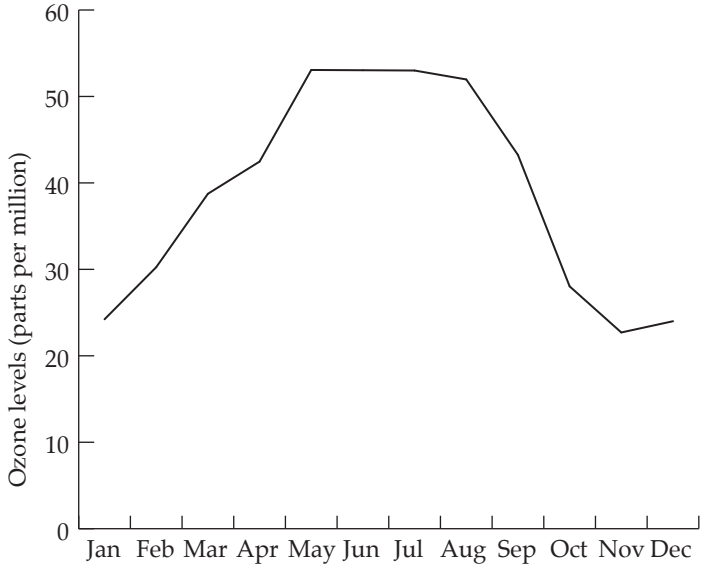
An increase in average temperatures throughout the year will have two opposing effects on Illinoisans' health. On the one hand, a decrease in the number of very cold days will likely decrease mortality caused by exposure to cold, which has been shown to increase cardiovascular stress. On the other hand, more very hot summer days will likely lead to an increase in emergency hospital admissions due to severe heat-related illnesses such as cardiovascular, respiratory, and cerebrovascular diseases. Rising humidity combined with increased heat across the Midwest could mean more days that reach extremes on the "Humid Heat Stroke Index." A heat wave in the City of Chicago in 1995 caused

Figure 5: Effect of Average Daily Temperature on Mortality, 1960-2004



Source: Barreca, Alan, Karen Clay, Olivier Deschenes, Michael Greenstone, and Joseph S. Shapiro. (2013). Adapting to climate change: the remarkable decline in the US temperature-mortality relationship over the 20th century. No. w18692. National Bureau of Economic Research.

Figure 6: Average Monthly Ozone Levels in the Chicago Metropolitan Area



Source: http://www.epa.gov/airquality/aird ta/ad_viz_tile.html

approximately 750 deaths.[7] Chicago in a few years will have a chance to experience more than ten days per year with heat and humidity conditions similar to the 1995 heat wave. Nobody knows whether it will be ten consecutive days, or ten days spread out, or even that it will be ten days. It could be five, or twenty.

These two effects are illustrated in Figure 5, which plots an estimate of the effect of average daily temperature on the monthly mortality rate using data for the United States from 1960-2014. It shows that cold and hot days are both associated with higher mortality rates. While Illinois may benefit from a reduction in cold-related mortality in the future, it is also important to educate the public about the dangers of extreme heat and to ensure adequate access to air-conditioned environments to minimize the increase in heat-related mortality.

Higher temperatures can also make air pollution worse. For example, Figure 6 shows that ozone levels in the Chicago area are highest during the heat of summer. High levels of air pollution put people at risk for irritated eyes and throats, and for lung damage. Some evidence suggests that air pollution may cause otherwise healthy people to develop asthma. Illinois policymakers can take steps now to reduce air pollution and help people cope with bad air days. For example, they could increase the state's excise tax on gasoline to encourage consumers to purchase fuel-efficient vehicles that produce less air pollution than conventional vehicles.

Rising crop insurance prices

Crop insurance in the United States is a public-private partnership. Private companies market and sell the policies, regulated by the United States Department of Agriculture (USDA). The USDA establishes which companies can participate, the insurance policies that can be offered, and the prices that providers can charge. The federal government also acts as a reinsurer, guaranteeing that farmers will be paid even in the event of widespread crop losses. Currently, the government pays close to two-thirds of the actuarially fair premiums. These crop insurance subsidies are among the largest safety nets available to farmers.

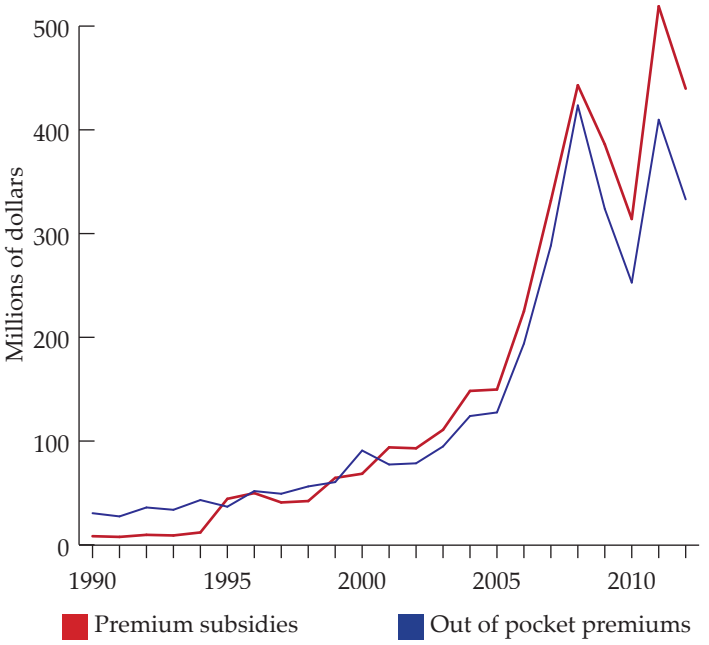
Figure 7 shows the long-run trend in crop insurance spending in Illinois, which closely parallels the general trend in the United States. In nominal terms, out-of-pocket spending on crop insurance has risen from less than $100 million in 2000 to nearly $450 million in 2011 (not including premium subsidies, which have also risen by nearly the same amount). Crop insurance premiums are likely to continue to rise in the future, due to crop losses associated with increases in droughts, floods, and other extreme events under a changing climate.[8] Without a corresponding increase in subsidies, crop insurance may become more expensive for farmers at the same time that overall farm incomes will be lower.

Rising crop insurance prices may not significantly affect economic welfare. Crop insurance represents a tiny portion of the federal government's budget (about $7-9 billion per

[7]Gordon, Kate, et al. (2014). Risky Business: The Economic Risks of Climate Change in the United States. Executive Summary. A Product of the Risky Business Project, co-chaired by Michael Bloomberg, Henry M. Paulson, Jr., and Thomas F. Steyer. Available at http://riskybusiness.org/.

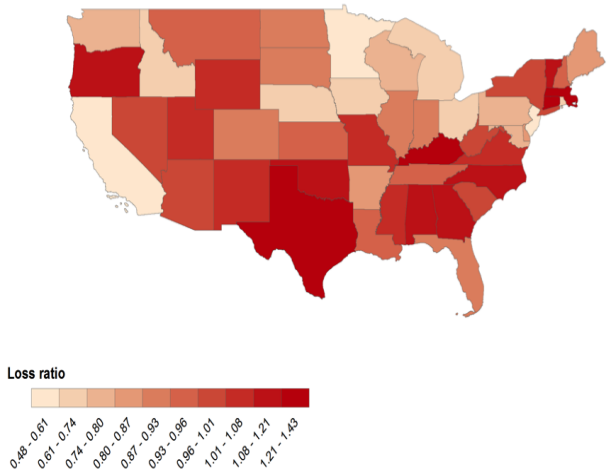
[8]Pryor, S. C., D. Scavia, C. Downer, M. Gaden, L. Iverson, R. Nordstrom, J. Patz, and G. P. Robertson. (2014). Chapter 18: Midwest. In *Climate Change Impacts in the United States: The Third National Climate Assessment.* J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds. U.S. Global Change Research Program. 418-440. doi:10.7930/J0J1012N.

Figure 7: The Long-run Trend in Crop Insurance Spending in Illinois



Source: Risk Management Agency, Summary of Business Data, Available at http://www.rma.usda.gov/data/sob.html

Figure 8: Crop Insurance Loss Ratios (indemnities paid out over premiums paid in)



Source: Risk Management Agency, Summary of Business Data, Available at http://www.rma.usda.gov/data/sob.html

year).[9] Thus, even a sharp increase in losses would be very unlikely to cause the government to reduce its subsidies or to default on its guarantees to private providers. Additionally, crop insurance is currently not actuarially fair, as illustrated by the fact that the "loss ratio" was less than 1 from 1982-2013 (a loss ratio of 1.0 is actuarially fair). Figure 8 illustrates that the loss ratio in Illinois is fairly average, as compared to other states. So, crop insurance premiums may fall slightly in Illinois to make insurance more actuarially fair, which could offset some of the increases due to climate change.

Rising flood insurance prices

Floods account for 90 percent of disaster declarations and cause close to $700 million in damages in Illinois each year. About 250,000 Illinois buildings are located in floodplains.[10] Flooding and the losses it causes are almost certain to increase with climate change.

Floods are not covered by most homeowners' insurance policies. Instead, flood insurance must be purchased separately through the federal government's National Flood Insurance Program (NFIP). To join NFIP, a community must adhere to certain floodplain management regulations. Currently, 770 Illinois communities participate. But climate change will increase the frequency and intensity of floods in Illinois,[11] so more communities may want to join NFIP to make flood insurance coverage available for their residents.

As with crop insurance, the risk of government default on its flood insurance obligations is low. But as floods become more prevalent in Illinois, flood insurance rates will increase unless local or state governments take more aggressive measures to protect communities from damage. Examples of such measures could include levees, retaining ponds, land-use management, and stricter building codes in flood-prone areas. Assistance with associated costs could come from federal programs that subsidize state and local mitigation projects, including the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA).

Changing agricultural production patterns and yields

Illinois is a major agricultural producer, with approximately 27 million acres of land under cultivation producing about $12 billion annually in agricultural output.[12] Illinois is the top producer of soybeans in the United States, with 15 percent of total production, 40 percent of which is exported. Illinois also produces 17 percent of all U.S. corn, trailing only Iowa.

Crop yields are vulnerable to weather. Changes in

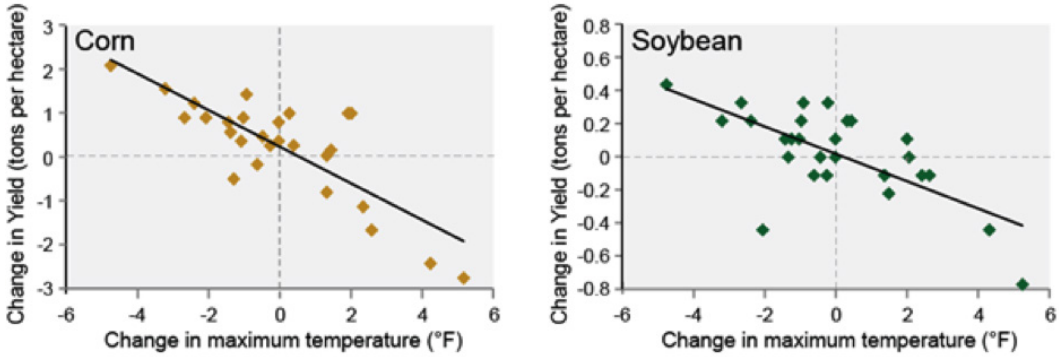
[9]The Environmental Working Group. The Case for Farm Subsidy Reform. Available at http://www.ewg.org/farming-and-the-environment/the-case-for-farm-subsidy-reform. Also see Nixon, Ron. (June 6, 2012). Crop insurance proposal could cost U.S. billions. The *New York Times*. Available at http://www.nytimes.com/2012/06/07/us/politics/bill-to-expand-crop-insurance-poses-risks.html?pagewanted=all&_r=0.

[10]Illinois Department of Natural Resources. The National Flood Insurance Program. See: http://www.dnr.illinois.gov/waterresources/pages/nfip.aspx.

[11]Pryor, S. C., D. Scavia, C. Downer, M. Gaden, L. Iverson, R. Nordstrom, J. Patz, and G. P. Robertson. (2014). Chapter 18: Midwest. In *Climate Change Impacts in the United States: The Third National Climate Assessment*. J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds. U.S. Global Change Research Program. 418-440. doi:10.7930/J0J1012N.

[12]The impact of tile drainage on Illinois agriculture. By the University of Illinois, College of Agricultural, Consumer and Environmental Sciences. Available at http://research.aces.illinois.edu/content/impact-tile-drainage-illinois-agriculture

Figure 9: Crop Yields Decline as Temperatures Rise



Source: http://nca2014.globalchange.gov/report/regions/midwest#statement-16934

temperature and rainfall will change agricultural production patterns and crop yields. In the short term, longer growing seasons and rising atmospheric carbon dioxide will increase yields of some crops, but these effects may be offset by losses in other crops. Additionally, short-term yield gains will likely be offset by more extreme weather in the long term.[13] Neither drought frequency nor duration has changed in the Midwest over the past century, but the average number of days without precipitation is projected to increase with climate change (see Figure 3). As a result, crops will suffer from water stress, and yields will decline. Some counties in Illinois could see crop losses due to extreme heat of up to 24 percent each year.[14] Moreover, the corn yield may fall by as much as 34 percent statewide.[15] Figure 9 shows how the yields of corn and soybeans are expected to decline as temperatures rise.

Policy responses: Investments in water resources infrastructure, electricity production, and transportation networks

For water needs in Illinois, surface water supplies 93 percent, and groundwater accounts for the remaining 7 percent. Illinois residents and businesses use water for transportation, power generation, industrial purposes, commercial purposes, golf course irrigation, agricultural irrigation, recreation, fire protection, and conservation. Withdrawals in Illinois by use are presented in Figure 10, which shows that the majority of Illinois water usage is for electric power generation (though much of that water is used for cooling and then returned to stream flow).

Extreme rainfall events are projected to become more frequent with climate change. More intense storms will increase flooding, soil erosion, and reduce water quality. Each of these will harm agriculture, human health, and infrastructure. In particular, more frequent storms will affect Chicago, disrupting travel, flooding basements, polluting waterways, and straining the city's infrastructure. The City of Chicago has proactively implemented the Chicago Climate Action Plan to mitigate and adapt to a changing climate.[16] And the city is currently working with the Metropolitan Water Reclamation District (MWRD) to prepare for increases in heavy storm events. Indeed, Chicago is a world leader in both traditional and novel approaches to storm water management. The MWRD is implementing a $30 billion project to install underground tunnels and reservoirs to mitigate storm flooding. And MWRD has established policies to hold more storm water on site, creating opportunities to introduce green infrastructure throughout Chicago. To date, the state has invested $5 million and the city has invested $50 million in green infrastructure projects, which can help reduce both storm water runoff and urban temperatures.[17]

With climate change, storms are expected to be less frequent, but more intense, making it more difficult for water to soak into the soil, increasing crop water stress, and reducing the supply of groundwater for irrigation. Irrigated agriculture is currently rare in Illinois, as most crops rely on rainfall. In 2012, Illinois had 5,627 "center pivot" irrigation systems, covering 543,576 acres of farmland.[18] Those acres account for just 2 percent of the total farmland in Illinois.[19] Most irrigation systems are located in parts of the state that have sandy soils and shallow aquifers that are able to sustain high capacity wells, places such as Mason, Tazewell, and

[13]Pryor, S. C., D. Scavia, C. Downer, M. Gaden, L. Iverson, R. Nordstrom, J. Patz, and G. P. Robertson. (2014). Chapter 18: Mid¬west. In *Climate Change Impacts in the United States: The Third National Climate Assessment*. J. M. Melillo, Terese (T.C.) Rich¬mond, and G. W. Yohe, Eds. U.S. Global Change Research Program. 418-440. doi:10.7930/J0J1012N.

[14]Gordon, Kate, et al. (2014). Risky Business: The Economic Risks of Climate Change in the United States. A Product of the Risky Business Project, co-chaired by Michael Bloomberg, Henry M. Paulson, Jr., and Thomas F. Steyer, available at http://riskybusiness.org/. This statistic is from the Executive Summary.

[15]Cai, Ximing, Dingbao Wang and Romain Laurent. (No Date). Impact of climate change on crop yield: A case study of rainfed corn in Illinois. Presentation. Available at http://web.extension.illinois.edu/iwrc/pdf/presentations/Ximing%20Cai.pdf

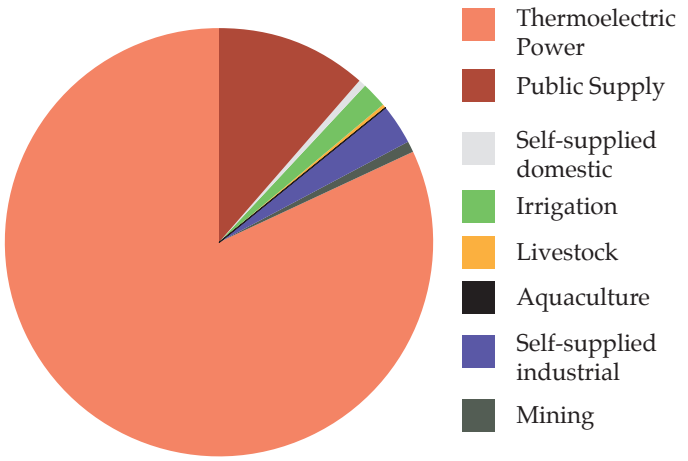
[16]Chicago Climate Action Plan available at http://www.chicagoclimateaction.org/pages/precipitation/21.php

[17]The Water Environment Federation. (October 29, 2013). Illinois and Chicago make investments in green infrastructure. Read at: http://stormwater.wef.org/2013/10/illinois-chicago-make-investments-green-infrastructure/

[18]Illinois State Water Survey. Available at http://www.isws.illinois.edu/docs/maps.asp

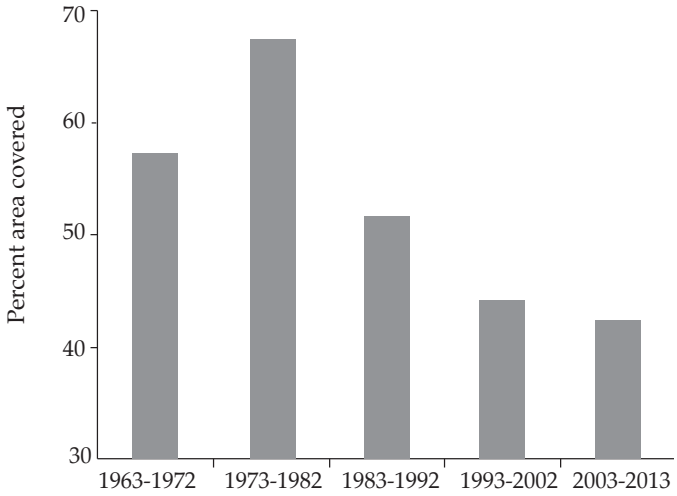
[19]Illinois has 26,937,721 acres of farmland according to the 2012 Census of Agriculture. For more, see: http://farmdocdaily.illinois.edu/2014/06/highlights-2012-census-of-agriculture-farmland-acreage.html

Figure 10: Uses of Water Withdrawals in Illinois



Note: Generated with data provided by the US Geological Survey, Available at http://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf

Figure 11: Ice Cover in the Great Lakes



Source: http://nca2014.globalchange.gov/report/regions/midwest#tab1

Whiteside counties. Demand for irrigation will likely increase in Illinois, particularly as concerns over drought increase and as farmers adapt their practices to produce higher crop yields.

Approximately 35 percent of the arable land in Illinois is tile drained.[20] That is, tile infrastructure has been installed to drain the soil and thus to reduce waterlogging of the crops, since the state has historically received plentiful rainfall and is relatively flat. Under a changing climate—with more flash storms in which less water is expected to infiltrate the soil—the removal of these vast networks of tile drains may provide an opportunity to improve soil moisture for crop production.

Illinois plays a critical role in the nation's food transportation network due to its productive capacity and transportation infrastructure, including railways, the Mississippi River, and the Great Lakes. However, the state's infrastructure is in poor condition. According to the American Society of Civil Engineers, Illinois has 2,311 structurally deficient bridges, and 73 percent of major roads are in poor or mediocre condition.[21]

As crop production patterns shift under a changing climate, new demands will be placed on the existing food transportation infrastructure. For example, new spatial patterns of grain production may increase demand for heavy freight on barge transport in the Great Lakes. As shown in Figure 11, ice cover in the Great Lakes has fallen since recording began in 1962. Less ice cover lengthens the commercial navigation season and increases the amount of winter shipping. In fact, the navigation season is already eight days longer than it was in the mid 1990s. Although less ice cover benefits commerce, it also increases shoreline scouring and introduces more invasive species.[22] In any case, changes in the seasonality of barge transport will affect overland transport modes as they bring commodities to port.

As policymakers consider where to make investments in infrastructure development, they could consider how crop production and transportation will change. Illinois may want to make investments in grain storage facilities, improvements to locks and dams along the Mississippi River, and enhancements to Great Lakes ports. The state may also want to consider improvements to intermodal connectors, such as truck route connections with ports or rail terminals. The Chicago Region Environmental and Transportation Efficiency (CREATE) program is a novel partnership between the state of Illinois, the Chicago Department of Transportation, the city of Chicago, Metra, Amtrak, and the nation's freight railroads to keep the Chicago area at the nexus of the nation's freight network by improving rail infrastructure.[23]

Climate change in Illinois will impact everything from electricity demand to human health and agriculture. Illinois policymakers need to consider many forthcoming issues. Yet researchers and policymakers have not yet confronted these issues, as the solutions will be complicated and require major tradeoffs. One first step could be to establish an advisory committee to begin outlining solutions for inevitable problems attributable to climate change. The state needs a climate action plan with a process through which possible solutions can be articulated, debated, and implemented. •

[20]The impact of tile drainage on Illinois agriculture. By the University of Illinois, College of Agricultural, Consumer and Environmental Sciences. Available at http://research.aces.illinois.edu/content/impact-tile-drainage-illinois-agriculture

[21]American Society of Civil Engineers 2013 Report Card for Illinois. Available at http://www.infrastructurereportcard.org/illinois

[22]National Climate Assessment. Available at http://nca2014.globalchange.gov/report/regions/midwest#tab1-images

[23]Chicago Region Environmental and Transportation Efficiency Program. Learn more at http://www.createprogram.org

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IGPA's Climate Change Policy Initiative is led by University of Illinois at Urbana Champaign finance scholars Don Fullerton and Julian Reif. The initiative seeks to understand how public policy can protect people from the effects of climate change in Illinois. Hotter temperatures will require more power for air conditioning, and greater weather volatility will mean increased numbers of droughts, floods, and storm damage. Beyond these consequences, Illinois will also be greatly affected by the interactions between uncertain water supplies and energy needs. The Climate Change Policy Initiative will evaluate forward-thinking public policies that can help protect Illinois's productivity, health, and future economic welfare.

Contact Don Fullerton, dfullert@illinois.edu or Julian Reif, jreif@illinois.edu, to learn more about the initiative.