COOK COUNTY
CLIMATE
CHANGE AND
PUBLIC HEALTH
ACTION PLAN
Acknowledgements:

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Introduction:

The Cook County Climate Change and Public Health Action Plan is a strategic plan to help Cook County adapt to predicted public health impacts resulting from climate change. The plan was written by Natalie Lake and Beau Garrett, seniors in the Environmental Engineering and Science program at Northwestern University as a Community Based Design (Civ_Env 398) project under the supervision of Professor Kimberly Gray and Dr. Sarah Lovinger, Executive Director of Chicago PSR.

The plan marks the first step in addressing the potential public health impacts of climate change in Cook County. To write this report, we consulted public health officials from Chicago and Evanston. Subsequent steps will involve officials from more state and local health departments, and conferences with public health researchers, government officials and non-profits involved in public health in our region.

With widespread scientific consensus that the world’s climate is changing, it is crucial to evaluate the potential health impacts that may result. While the effects of climate change, climate variability, and weather are not fully known, predictions of possible health effects already exist and planning/preparation need to begin.

Climate change, climate variability, and weather have a variety of direct and indirect health effects. Climate change is likely to affect the frequency and intensity of extreme weather events such as floods, drought, severe storms, heat waves, hurricanes, tornadoes, and wildfires. Climate change is also likely to modify natural systems, which will in turn alter the prevalence of vector-borne diseases, waterborne illnesses, and foodborne illness by changing their ability to spread. Finally, climate change will also affect the incidence of allergens and air pollution-related diseases by altering natural systems.

The relationship between climate change and the incidence of disease is complex, with a variety of social factors playing important roles in determining health outcomes in individuals and groups like to be affected. These factors, such as economic status, initial health status, effectiveness of public health programs, and access to medical care all affect a person’s resilience to disease and ability to recover from negative illness. Our plan provides information on public health programs and makes allowances for vulnerable residents; subsequent plans will need to address these factors in more depth.

Cook County, with a population of over 5 million people, is the second most populous county in the United States, and is home to over 40.5% of the population of Illinois. With research indicating that the Midwest is most likely to experience the greatest number of climate change-related illnesses and deaths in the United States (Greenough, 2001), this plan marks
the critical first step in addressing the affect of climate change’ on public health in Cook County.

Goals and Objectives:

The plan’s goals and objectives are to outline predicted health outcomes associated with climate change in six key areas, and offer climate change and public health adaptation strategies.

Goal 1: To inform public health professionals, state agency personnel, policy-makers, healthcare providers, vulnerable populations and the general public on human health risks associated with climate change

Goal 2: To identify vulnerable populations who are especially at risk for negative health outcomes as a result of climate change

Goal 3: To move the focus from mitigation to adaptation and recommend potential adaptation strategies to address climate change effects on public health

Goal 4: To encourage planning and preparation for emergency response to protect the public’s health against possible health outcomes resulting from climate change

Goal 5: To expand the scope of this plan to a statewide preparedness plan in the future.
Focus Areas:

Extreme Heat and Weather:

Researchers predict that climate change will increase the severity, frequency, timing, and duration of extreme weather events, which in turn will increase health risks (Greenough et al, 2001). The Midwest is particularly prone to increasingly severe storms, extreme heat events, tornadoes, and flooding (Greenough et al, 2001). Tornadoes and floods may lead directly to increased injuries and death, but, these disasters can also lead to indirect threats to human health during a community’s recovery period. Such threats include increased infectious disease risk, increases in disease-causing molds and fungi in homes and other buildings, and decreases in water quality, compromising health. When water infrastructure such as treatment systems and storm water collection is compromised, water quality will deteriorate. Subsequently, during the redevelopment period following a disaster, molds and fungi are likely to grow on surfaces, which can lead to an increase in allergy symptoms.

The U.S. is likely to experience increases in extreme cold, extreme heat, hurricanes, floods, wildfires, droughts, tornadoes and severe storms. CDC, 2010). With the excessive deaths seen in Europe during the 2011 Deep Freeze, extreme cold events are a substantial cause of concern in the U.S. Between 1979 and 2002, 16,555 deaths caused by exposure to excessive natural cold were reported in the U.S. (Fallico et al. 2005). The most vulnerable populations in extreme cold events are people with pre-existing respiratory illnesses, people lacking protective clothing, people with inadequate income, and the elderly (Hajat et al, 2007).

Extreme heat, which varies geographically, poses a greater threat than extreme cold. Extreme heat events are the most common cause of weather-related human mortality in the U.S. (CDC, 2010). The Midwest is susceptible to morbidity and mortality from extreme heat events because Midwestern populations are less accustomed to extreme heat. While extreme heat waves have been documented in St. Louis, Kansas City, Cincinnati, and Philadelphia, two of the most severe heat waves to strike the U.S. have occurred in Chicago. 739 excess deaths were reported in the 1995 heat wave and another 110 excess deaths were reported in the 1999 heat wave (Browning, 2006). While heat-related deaths are difficult to track, the 1995 and 1999 heat waves did teach the public health sector many crucial facts about which members of the population are most vulnerable in these situations.

In preventing excessive deaths, age, body composition, level of physical activity, and fitness are critical determinants of how well an individual can react to extreme heat. Heat-related illnesses such as heat cramps, heat exhaustion, heat syncope, and heat stroke are likely to increase with increasingly common extreme heat events. Chronic health conditions can increase an individual’s vulnerability to a heat-related illness. Social factors also make certain populations more vulnerable than others. In extreme heat events, the most vulnerable
populations are the socially isolated, the mentally ill, young children, the elderly, outdoor laborers, transients, people taking chronic medications, and people without access to air conditioning (Klinenberg, 2002.)

In both Chicago heat waves, the elderly were especially vulnerable because of their diminished health, decreased mobility, and social isolation. With the U.S. population aging, it is predicted that heat-related mortality will increase. Figure 1 presents the results of a study of temperature-mortality relative risk functions for 11 U.S. cities. As a northern city, Chicago is determined to have an increasingly high risk of mortality as temperatures climb above 80°F.

![Figure 1 - Temperature-mortality relative risk functions for 11 U.S. cities, 1973-1994 (Curriero, et al., 2002)](image)

Another cause of concern in Cook County is the urban heat island effect on temperature. With urbanization, microclimates are created where air temperatures can elevate as much as 10°F in certain areas. As a result of buildings, lack of vegetation, heat emissions from buildings, vehicles and air conditioning units, the higher temperatures and higher pollution can result in higher negative heat-related health outcomes. Studies showed that the 1995 heat wave was exacerbated by the reduced albedo and increased emissivity of urban areas, in which urban structures trap heat, night-time temperatures do not cool, and the overall heat index increases (Semenza, 1999). Though the heat island effect and higher ozone levels for Chicago do not exist downtown but in the western and northern suburbs, respectively (Finster and Gray, 1999), this phenomenon can play a major role in heat emergencies.
The extreme weather events of 2011 in Cook County appear to be in accordance with the current climate change predictions. With two 100-year storms occurring during the summer of 2011, as well as the 20 inches of snow, which fell in 24 hours in February 2011, it is obvious that officials in Cook County must plan and prepare for both summer and winter weather emergencies. We recommend that Cook County officials improve surveillance of these extreme weather events, identify vulnerable populations, improve communication with the public during these extreme weather events, and review their emergency operations plans. We also recommend that certain specialists like geriatricians, community health physicians who care for low-income, minority residents, and homeless advocates be consulted in creating the emergency operations plans so that all vulnerable populations are included. From previous extreme weather events, providing emergency medical services for these particular populations has proven to be difficult. Within Cook County, the city of Evanston has one of the highest populations of transients and elderly. As a result, Evanston has begun to pay special attention to these populations in creating their plans. This practice is recommended for all of Cook County.

**Foodborne Illnesses:**

In addition to heat waves, power outages, often a result of extreme weather, may cause increases in foodborne illnesses. When power outages occur during extreme weather events, food spoils easily, and foodborne illnesses may result. Foodborne illnesses are highly under-reported in the U.S., primarily because very few people seek medical attention for this problem. Despite the under-reporting, epidemiologists have determined that there are approximately 76 million cases of foodborne illnesses in the U.S. each year, resulting in approximately 5000 deaths. Of the cases reported, 67% of cases are due to viruses (primarily noroviruses), 30% to bacteria (primarily *Campylobacter* and *Salmonella*) and 3% to parasites (primarily *Giardia* and *Cryptosporidium*). While most of the disease outcomes are mild, they can be fatal or debilitating in vulnerable populations, particularly in children ages 1-4 and in older adults (>80 years). These populations comprise 25% of hospitalizations for foodborne illnesses, and older adults account for 85% of the deaths due to foodborne illness (Gangarosa *et al.*, 1992). The aging U.S. population draws attention to the need to address this problem.

Climate change may be expanding the range of pathogen distribution, which could increase the number of food-borne pathogens in a given region. The most commonly cited case is that of the outbreak of shellfish-associated *Vibrio parahaemolyticus* in Prince William Sound in Alaska. *V. parahaemolyticus* had never been found in Alaskan shellfish before the outbreak in 2004. It was commonly thought that the waters could not support the species, but with the increased mean daily water temperature, the range of the oysters hosting *V. parahaemolyticus* increased and an outbreak of gastroenteritis resulted (McLaughlin *et al.*, 2005). Incidents
similar to what happened in the Prince William Sound are predicted to increase as climate change progresses.

Similarly, there is strong evidence that increasing global temperatures will increase rates of salmonellosis (Mouslim et all, 2002). In Illinois between 2009 and 2010, the reported cases of Salmonella rose from 1,484 to 1,982 cases, a 34% increase. *E. coli* increased from 124 cases in 2009 to 156 cases in 2010. *Salmonella*, and other pathogens adapted to growing under low nutrient and warm temperature conditions are likely to increase in numbers with climate change, and the diseases associated with these pathogens are also likely to increase.

In order to adapt to these increases, we recommend that Cook County improve its monitoring and response systems. We recommend that during power outages, Cook County improve efforts to send messages to restaurants and homes about the need for safe refrigeration practices, and the need to discard food deemed unsafe. The City of Evanston has implemented an effective reverse 911 system, which communicates with the public regarding suggested precautions. Officials from the Evanston Health Department also call the crucial facilities in Evanston to ensure they have backup power, and water. We recommend that all of Cook County adopt these practices.

*Vector-borne Diseases:*

Climate change is significantly altering the incidence of endemic vector-borne diseases (VBD) in the U.S. Based on the ecology of vectors, hosts, pathogens, and pathogen transmission cycles, the incidence of certain VBD are likely to change. In the U.S., zoonotic transmission of infectious diseases has changed over the past century. Though the incidence of certain tropical diseases such as malaria, yellow fever, and dengue have remained low, researchers predict higher rates of these diseases in a changing US climate (Reiter, 1996). Higher minimum temperatures have favored the expansion of tick distributions while also helping mosquitoes to reproduce more quickly. VBD in the US that have already spread in all likelihood due to changed climate conditions include West Nile Virus (WNV) and Lyme disease, and probably also Ehrlichiosis.

Public health officials in Illinois monitor the following VBD: Lyme disease, human anaplasmosis, babesiosis, human ehrlichiosis, Rocky Mountain spotted fever, powassan encephalitis, malaria, dengue, and tularemia. Records show an increase incidence in many of these VBD in our state within the last decade. In 2001, there were 32 cases of Lyme disease reported in Illinois; this increased to 127 cases in 2005 and 135 cases in 2010. While there was only 1 reported case of human anaplasmosis/human ehrlichiosis in 2000, there were 42 cases in 2009. Similarly while there were only 5 cases of Rocky Mountain spotted fever in
2000 in Illinois, there were 110 cases in 2008 and 49 in 2009. While the highest number of West Nile Virus cases occurred in 2002 with 884, the number increased from 5 to 21 between 2009-2010. Of the 21 West Nile Virus cases, 17 were in Cook County. While there is some year-to-year variability, the prevalence of VBD has been increasing in the past 10 or so years. Experts link this increase to changes in climate (IDPH, 2000-2010; CCDPH 2010). Figure 2 shows the increasing trend of Lyme disease incidence in Illinois, while Figure 3 shows the increasing trend in ehrlichiosis/anaplasmosis incidence in Illinois from 1990-2009.

![Lyme Disease Incidence in Illinois](image)

Figure 2 - Lyme Disease Incidence 1990-2009, Illinois
To prevent and plan for the increased risk of VBD, we recommend that Cook County increase its surveillance of the vectors, increase vector control, enhance communication with the public about risks/prevention, and improve vaccination of dogs against diseases such as leptospirosis. We also recommend that public health officials work with physicians, hospitals, and local medical and veterinary societies to enhance awareness of trends in VBD to maximize early diagnosis and treatment.

*Water Quality and Quantity and Waterborne Diseases:*

Climate change will affect water resources in several ways. Some areas will face water shortages; other areas will experience flooding. Water quality will also be impaired periodically.

Water shortages are predicted to occur throughout the U.S. due to increases in water demand, decreases in snowmelt, and drought. Droughts will increase water temperatures and will promote algal and microbial growth. Intense precipitation will lead to higher runoff rates and higher levels of water contamination (Patz et al., 2008). Waterborne illnesses such as legionellosis from exposure to pathogenic microorganisms and chemically contaminated drinking water will become more prevalent. Figure 4 shows drinking waterborne disease outbreaks and 90th percentile precipitation events from 1948-1994.
The figure demonstrates that a majority of waterborne disease outbreaks in the 46-year span were preceded by an extreme level of precipitation (in the highest 10% of all recorded precipitation events). Clearly, as Cook County has experienced waterborne disease outbreaks in the past, it will continue to be at risk as climate change impacts extreme flooding and storm events in the future.

An example of how heavy storms likely caused by climate change exacerbate water quality issues in Cook County is the problem of storm water overflow into the Chicago Deep Tunnel, a $3 billion civil engineering project commissioned by the Metropolitan Water Reclamation District of Greater Chicago to divert storm water and sewage into temporary holding reservoirs. The current combined sewer system is not equipped to handle excessive storm water runoff and infiltration after accepting sanitary and industrial effluents, and as a result, large quantities of contaminated storm water are discharged into Lake Michigan. This is a critical issue, as 19 billion gallons of disease-causing and fish-killing wastewater were discharged between 2007-2010, compared to 12 billion gallons discharged between 1985-2006 (Hawthorne, 2010), despite the fact that the Deep Tunnel project is nearing completion. As the current Deep Tunnel storage capacity is likely under designed, contamination of Lake Michigan will continue to be an issue, as climate change will likely contribute to increasing volumes of storm water.
The best way to prepare for the effect of climate change on water quantity and quality as well as the potential for waterborne illnesses is for water utilities to adopt resilient and adaptive, ecologically-based water treatment infrastructure. Diseases of particular concern for Cook County that water and wastewater utilities must prepare for are cryptosporidiosis, leptospirosis, and giardiasis.

Beach closures are an indicator of recreational water quality issues, which climate change is predicted to affect. When culture methods are the basis of *E. coli* monitoring programs (the City of Chicago tests recreational waters once per week, and the city of Evanston tests the water at its beaches twice per day during the summer swimming season), the current system still places residents at risk. The 24-hour lag between sampling and the availability of test results may lead to contaminated water exposure. A shift towards prevention of exposure to contaminated water throughout the county by surveying different parameters that are known to indicate unsafe levels of *E. coli*, such as air quality, rainfall, water temperature, turbidity, odor, bather loading, floating solid pollution, and presence of birds and algae would be more effective. Some managing authorities for coastal beaches now use a predictive model called SwimCast, which can give a more accurate assessment of current water quality as opposed to the current system that relies on the previous day’s bacterial density. Predictive modeling should be used more extensively in the future, as the Natural Resources Defense Council’s Illinois 2010 Monitoring Results reported significant exceedances of standards. For example, 61% of bacterial samples exceeded state standards at Winnetka Elder Park (NRDC, 2010). We recommend that Cook County adapt the SwimCast predictive model to monitor all recreational water sources.

**Air Pollution & Allergens:**

The likelihood of climate change to increase human exposure to air pollutants and airborne allergens is a local, regional, and national concern. The World Health Organization (WHO) predicts that 2 million premature deaths per year can be attributed to air pollution (WHO, 2010). Air pollution disproportionately affects vulnerable populations such as young children, the elderly, and individuals with preexisting cardiovascular or respiratory illnesses. Due to anthropogenic activity, particulate matter (PM) in the air is expected to increase, which may exacerbate chronic cardiovascular and respiratory disease. Further research is needed to fully understand the relationship between climate change and fine particles. For example, depending on their chemical nature, fine particles may attenuate (sulfate particles) or amplify (carbon or soot particles) climate change; however, the health effects are undoubtedly deleterious (BAAQMD, 2012). Ground-level ozone, which is a greenhouse gas and a precursor of smog, is also expected to increase with increasing temperatures. Figure 5 shows frequency distributions of summertime daily maximum 8-hr ozone concentrations.
based on the Intergovernmental Panel on Climate Change (IPCC) A2 emissions scenario, which assumes delayed economic development.

![Ozone Concentration Graph](image)

**Figure 5 - Frequency Distributions of Summertime Daily Maximum 8-hr Ozone Concentrations over the Eastern U.S. in the 1990s, 2020s and 2050s based on the A2 Scenario (Hogrefe, et al., 2005)**

The figure demonstrates that ozone concentrations are expected to consistently increase over time as a result of climate change and other factors. Higher prevalence of ground-level ozone can be expected to cause lung injury and premature mortality, and worsen respiratory diseases (MDH, 2010).

Finally, pollen and mold counts, distributions, attributes, and season length are all likely to change with climate change, leading to increases in respiratory diseases, seasonal allergies, and chronic obstructive pulmonary disease (COPD), or emphysema (Beggs, 2004). This is a critical issue in Cook County, as Chicago experiences excessive air pollution and has the highest rates of childhood asthma in the country. According to the Respiratory Health Association of Metropolitan Chicago, the asthma hospitalization rate in Chicago is nearly double the national average, and asthma is the number one cause of school absenteeism due to a chronic illness among children. Asthma also disproportionately affects minority residents in the area, as Puerto Rican children have the highest asthma prevalence rate (34%) and age-adjusted asthma mortality of non-Hispanic blacks is nearly five times that of non-Hispanic whites in Chicago (Respiratory Health Association of Metropolitan Chicago).
Methods to reduce the risk of lung disease due to air pollution must include assessing limitations in tracking health outcomes related to exposure to air pollution and allergens, and developing robust data analyses on the relationships between ambient temperature, outdoor allergens, air pollution and cardiovascular or respiratory health outcomes. Furthermore, there is a need to educate pediatricians and those who care for children about the links between hot weather and asthma outbreaks in order to better prepare patients. Finally, there is a need to address the factors that cause minority groups to be at greater risk for asthma. The recent decision to close the coal-fired power plants located on Chicago’s Southwest side will improve air quality and could lead to decreased asthma rates, particularly among minority children.

**Recommendations:**

**Mitigation techniques**

Climate change mitigation encompasses actions that are taken to reduce the existence of greenhouse gases that contribute to climate change. While government organizations such as EPA work to protect the environment from harmful industrial emissions, there are other ways that individuals can contribute to climate change mitigation. Major techniques include, but are not limited to:

- Properly insulating homes
- Installing energy efficient fixtures
- Conserving water and retrofitting flush and flow fixtures
- Reducing the use of motor vehicles
- Choosing to walk or increasing bicycle and/or public transit usage
- Eating locally-grown food and eating less meat

In addition to reducing anthropogenic contributions to atmospheric concentrations of greenhouse gases, incorporating mitigation techniques into everyday practices has the added benefit of promoting healthy individual lifestyle choices. For example, walking or riding a bike rather than driving can improve exercise tolerance and combat weight gain and obesity. Eating more locally grown produce and less meat can provide a healthier diet.

**Adaptation strategies**

One of the primary objectives of this plan for Cook County is to reinforce the importance of adapting to the public health effects of climate change, as current trends will be extremely difficult to reverse by individually attempting to employ climate change mitigation. Successfully implementing the goals of this plan will include the establishment of the following adaptive measures:
• Development of climate models and research specific to Cook County to promote awareness of the dangers of climate change
• Improvement of ongoing extreme weather surveillance programs
• Improved communication with the public during extreme weather events
• The involvement of geriatricians, community health physicians who care for low-income and minority residents, and homeless advocates with the review of emergency operations plans
• Collaboration with the veterinary sector to prevent and manage zoonotic disease outbreaks
• More comprehensive messaging regarding refrigeration and the need to discard food after power outages
• Improvement of vector surveillance and control
• Collaboration of public health officials with physicians, hospitals, and local medical societies to enhance awareness of trends in VBD
• Improvement of health services during infectious disease outbreaks
• Better diagnostic support during epidemics
• Further identification and classification of vulnerable populations
• Eradication of homelessness
• Development of climate adaptation plans by local water and wastewater utilities
• More resilient and adaptive, ecologically-based water treatment infrastructure
• Assessment of limitations in tracking health outcomes related to exposure to air pollution and allergens
• Development of robust data analyses on the relationships between ambient temperature, outdoor allergens, air pollution and cardiovascular or respiratory health outcomes
• Education of pediatricians and those who care for children about the links between hot weather and asthma outbreaks
• Mitigating the factors that cause minority groups to be at greater risk for asthma
• Better communication with the public about risks and prevention of disease

Conclusions:

Based on current societal trends such as industrialization and fossil fuel combustion, the predicted effects of climate change on public health are imminent and are not simply issues to be experienced by unknown future generations. The U.S. and Cook County should expect to see more frequent and severe weather events, greater rates of foodborne, vector-borne, and waterborne diseases, changing distributions of allergens, and greater prevalence of water quantity and air and water quality issues.

Below is a summary of the specific goals put forth by the Cook County Climate Change and Public Health Action Plan.
Goal 1: To inform public health professionals, state agency personnel, policy-makers, healthcare providers, vulnerable populations and the general public on human health risks associated with climate change

- Educate the above parties about the effects of climate change on extreme weather events, foodborne illnesses, vector-borne diseases, waterborne diseases, air pollution, and outdoor allergens, and offer possible prevention strategies

- Support the development of local and regional climate models and data collection to better understand climate change effects on public health in Cook County

- Continue to research and evaluate the relationship between air temperature, air pollutants, outdoor allergens and respiratory and cardiovascular health outcomes, while assessing limitations related to tracking these health outcomes

- Increase awareness of climate change effects on water quality and quantity as well as the impact that water issues have on public health

- Track extreme weather data in Cook County that impact public health, including heat events, flooding, drought, tornadoes, extreme cold and extreme precipitation

Goal 2: To identify vulnerable populations who are especially at risk for negative health outcomes as a result of climate change

- Identify populations vulnerable to extreme weather events, food and water contaminants, vector-borne diseases, outdoor allergens and air pollution

- Identify key determinants of vulnerability such as factors that affect resilience and recovery from climate change health effects

- Ensure that vulnerable populations are specifically targeted in emergency operations management plans

Goal 3: To move the focus from mitigation to adaptation and recommend potential adaptation strategies to address climate change effects on public health

- Assess current public health departments’ capacity to adapt to climate change

- Bring attention to the fact that mitigation alone is no longer sufficient given the fact that climate change effects are emerging rapidly, and offer various adaptation strategies

Goal 4: Encourage planning and preparation for emergency response to protect the public’s health against possible health outcomes resulting from climate change
- Assess and improve current emergency response plans, resources, capabilities, and systems efficacy

- Offer suggestions for the issues that public health officials must consider when developing emergency response plans

- Develop mechanisms to broaden engagement of, and increase coordination among, all stakeholders to promote shared problem solving and joint management of health and safety needs both prior to and during incidents

- Outline what is working well in certain areas of Cook County so that these same practices can be incorporated in other areas of Cook County

**Goal 5: To expand the scope of this plan to a statewide preparedness plan in the future.**

Under the leadership of Chicago PSR, this Climate Change and Public Health Plan for Cook County represents the first step in a larger initiative to engage the public health community to set forth an adaption plan for our area. This plan provides information about the scope of the problem and suggests action steps to address the issue of climate change and public health preparedness in Cook County. The next step that Chicago PSR proposes is to establish a Climate Change and Health Care Preparedness Council - which we will invite all units of government within Cook County to join - to address regional climate change impacts. The Council will meet monthly for one year. The Council would organize and present a one-day conference for local, city, county and state health officials and other relevant government officials, hospitals, medical and public health associations, NGOs, and researchers to provide input on this plan and develop a roadmap and policies for implementation of the plan.

The council would also develop a website for dissemination of the plan and ongoing preparedness.

We would issue a final *Cook County Climate and Health Action Plan* that provides for coordination among governmental entities, includes all necessary detail, and includes and is signed off on by a comprehensive group of governmental agencies within Cook County and is set for implementation.

This is just the beginning of the greater effort to prepare public health infrastructure to adapt to climate change. Success in implementing this plan will help Cook County serve the region with respect to recognizing and adapting to the interconnectedness of climate change and public health.
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