Guiding Principles

▲ Urban gardens, such as the one at Badger Rock Middle School, offer healthy food, low-carbon food, and opportunities for education in many areas including sustainability. *Photo: Center for Resilient Cities 2019*

Equity & Justice

Globally nations and communities of color, as well as low-income populations, are responsible for fewer GHG emissions than other populations and are more vulnerable to, and disproportionately affected by, the adverse impacts of climate change, including health impacts, loss of home and property, and general quality of life. There is no reason to think that this is any different here in Dane County. In fact, there is data that tells us it is the same. The *Race to Equity* initiative baseline report released in 2013 by the Wisconsin Council on Children and Families (now Kids Forward) documents the "exceptional magnitude" of disparities between African Americans and whites in Dane County. On indicators such as unemployment rate, childhood poverty, adult poverty, graduation rates, school suspension rates, foster care, juvenile arrests, adult arrests, and others, the report shows that the disparity between blacks and whites in Dane County is greater than it is in Wisconsin as a whole and greater than it is nationally; in most cases, much greater. These inequities, which the Race to Equity initiative acknowledges apply to other ethnicities, not just African Americans, compromise the ability for communities of color in Dane County to adapt to climate change

and effectively prepare for severe weather events and other climate-related impacts. It is important to note the Race to Equity Initiative is a long-term effort focused on solutions and the Initiative developed a roadmap, made many recommendations, tracked progress, and measured many positive changes since the baseline report.

A strong focus on equity is also important because it will take everyone's involvement to get Dane County on the path to deep decarbonization; and it is likely that people of color will be among the strongest champions of mitigating climate change. There is solid data behind this claim. According to a Yale Program on Climate Change Communication study, a large majority of Latinos think the US should reduce its GHG emissions regardless of what other countries do, and 81 percent of Latinos support requiring fossil fuel companies to pay a carbon tax.

The Spirit Level

An equity focus is critical to ensure that our climate solutions are not only just, fair, and equitable but also effective. It is also important to understand that just as effective climate solutions have many co-benefits such as health and economic benefits, work to increase equity will directly improve a litany of social problems. Richard Wilkinson and Kate Pickett make an incredibly strong case for this point in their best seller "The Spirit Level, Why Greater Equality makes Societies Stronger." Wilkinson and Pickett look at the relationship between equity and nine social problems with readily available, international data. The nine social problems or concerns are:

- Level of trust
- Mental illness, including drug and alcohol addiction
- Life expectancy and infant mortality
- Obesity
- Children's educational performance
- Teenage births
- Homicides
- Imprisonment rates
- Social mobility

They combined the data from all of these and created an index of health and social problems and showed that national income level per person is only weakly related to the health and social problems index (Fig. 7.1), however, health and social problems are very closely related to inequality in relatively rich countries

(Fig. 7.2). Countries with greater equality tend to have fewer health and social problems. They make the case even stronger by showing statistically, the social problems are also correlated with equity across all the United States (Fig. 7.3). They go on to show that across countries and states, each of these social problems also directly correlates to inequality, so that the higher the inequality the greater the social problems. Inequality is at the root of many of our social problems, and addressing equality is important when addressing climate change.

A Social Justice Lens

As we flesh out the details of this CAP and its implementation, the Office of Energy & Climate Change is prioritizing communities of color, low-income communities, and other vulnerable communities in a variety of ways. One way is by collaborating with the Madison-Dane County Public Health Department and the City of Madison on public engagement with community-based organizations. Another way is through health equity training provided by the Healthy Wisconsin Leadership Institute. The Healthy Wisconsin Leadership Institute (HWLI) conducts training for health professionals and others that focuses on the social determinants of health through an equity and justice lens.

Fig. 7.1: Health and social problems are not related to average income in rich countries.

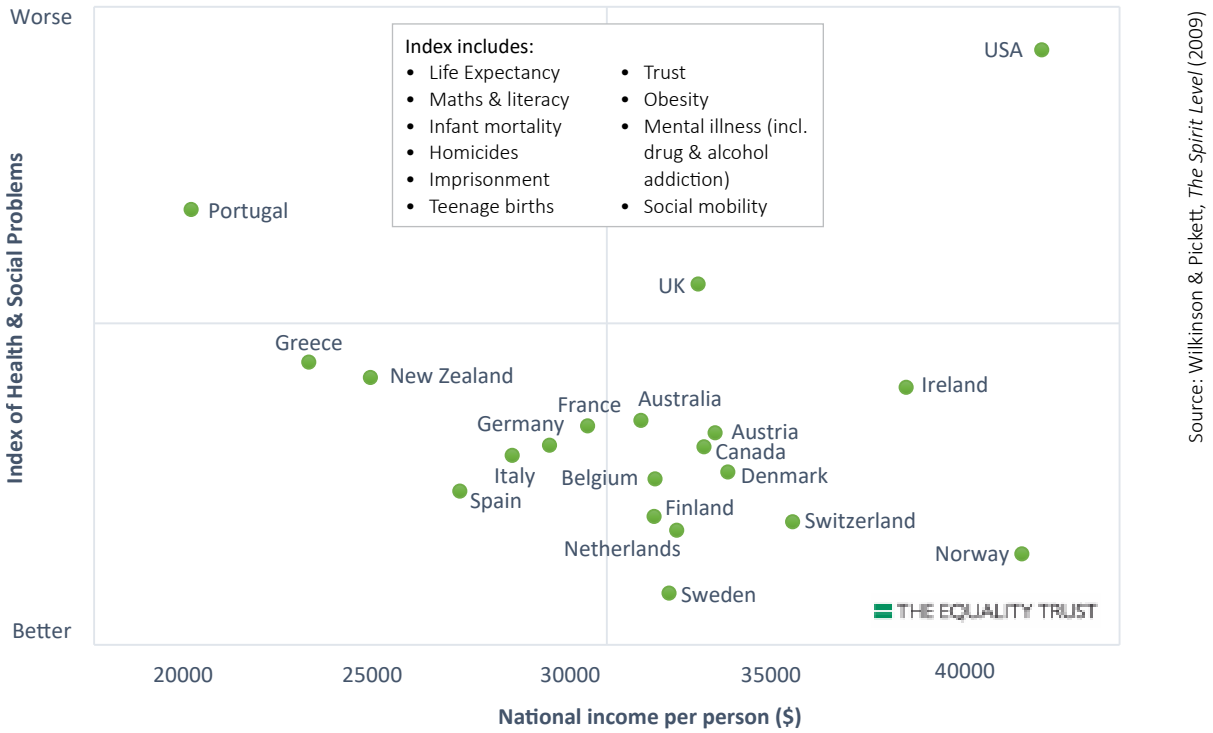


Fig. 7.2: Health and social problems are worse in more unequal countries.

Fig 7.3: Health and social problems are worse in more unequal US states.

The Office of Energy & Climate Change with the City of Madison, health officials, and community groups has completed a ten-month training with the HWLI and has now begun a second, three-year phase of training in the health-equity space.

It is useful to recognize that there is a similar deep-decarbonization effort at the Midwest region level. RE-AMP is a network of approximately 130 NGO organizations focused on equitable deep decarbonization. Many organizations are advocating for, analyzing, or modeling what deep decarbonization looks like for their area. RE-AMP is one of the few that is conducting this work through a very deliberate and thoughtful equity lens. The Office of Energy & Climate Change will develop a strong collaborative working relationship with RE-AMP going forward.

Equitable and Just National Climate Platform

On July 19, 2019, a critical paper was released with the title: "Equitable & Just National Climate Platform" (EJNCP). The 19 national and regional environmental justice organizations and national environmental organizations who authored it describe it this way:

> This platform lays out a bold national climate policy agenda that advances the goals of economic, racial, climate, and environmental justice. The platform identifies areas where the undersigned environmental justice (EJ) and national groups are aligned on desired outcomes for the national climate policy agenda. The platform also lays the foundation for our organizations to vastly improve the way we work together to advance ambitious and equitable national climate policies and to work through remaining differences.

The EJNCP describes 13 achievements necessary to build an inclusive, just, and clean-energy economy:

- No community left behind
- A healthy climate and air quality
- Reduction in cumulative impacts
- An inclusive, just, and pollution-free energy economy
- Access to affordable energy
- A healthy transportation and goods movement system
- Safe and healthy communities and infrastructure
- Economic diversity and community wealth building
- Anti-displacement, relocation, and right to return
- Water access and affordability

Climate Champions

Results Ahead of the Plan

Dane County convened the Dane County Council on Climate Change to create this Climate Action Plan, and before the plan was even half finished, council members began partnering together to increase equity and promote clean energy.

At an early Climate Council meeting Chad Sorenson, the CEO of SunPeak, a Madison-based firm that designs and installs PV systems for businesses around the nation, met the Director of Workforce Development Services at the Urban League. Chad learned about the Urban League's Skilled Trades Apprenticeship Readiness Training (START) program, which works with underemployed and formerly incarcerated individuals, preparing them for careers in the trades.

▲ Cornelius Perkins (center), has quickly become a team leader at SunPeak. The solar Installers always start their day with stretching, then a team-building huddle which ends with everyone putting a hand in the center and saying, "1-2-3 SunPeak!" Here Cornelius fires up his co-workers in the rally circle before attacking the job.

Sorenson recognized that the START graduates could be great entry-level staff at SunPeak. So SunPeak's Director of Project Management, Casey Joyce, started working with the Urban League.

Terry Birts, the Construction Manager at the Urban League, coordinates the START program and notes "We met with Chad to talk about how we could help him gain good, work-ready employees. They wouldn't be seasoned, but they're eager and ready to start a career." The partnership has resulted in SunPeak hiring about a dozen START graduates from the Urban League. Everyone is excited about the results.

Cornelius Perkins, a solar installer at SunPeak and START graduate, is enthusiastic about his future at SunPeak. "(Joyce) took a chance with me. Knowing my prison background, he didn't discriminate. He just wanted me to have an opportunity with a great company that's taking off. I really appreciate that from him. I always say, when someone says they believe in me, I go hard."

The partnership benefits SunPeak, too, giving them access to job-ready, entry-level employees who receive ongoing mentor support from the Urban League. "I like to think of this as a perfect example of how we can do well by doing good. And that is really rewarding, not only for me but for everybody that works here," says Joyce. "We benefit greatly from all the Urban League employees." ☀

- Self-determination, land access, and redevelopment
- Funding and research
- U.S. responsibility for climate action and international cooperation

You can read more about the platform here: ajustclimate.org.

Other Resources for Creating an Inclusive Process

We made a concerted effort to have diversity in our Climate Council, both in terms of ethnicity and race, but also in terms of perspective and experience. While we had four organizations that brought strong equity and justice perspectives, we didn't achieve the amount of diversity we would have preferred. We developed this CAP with a process very similar to the process used in probably 99% of all city and county climate action plans across the country – essentially a top-down process. At the end of our Climate Council process, I learned of another way – a more inclusive way, a bottom-up process. The NAACP Environmental and Climate Justice Program has developed a toolkit to help you conduct this type of process called *Our Communities, Our Power, Advancing Resistance and Resilience in Climate Adaptation, Action Toolkit*. Another excellent resource for this type of planning is the National Association of Climate Resilience Planners and the *Community Driven, Climate Resilience Planning: A Framework*. I strongly recommend you consult these excellent resources before undertaking climate action planning.

Economic Benefits

It is critical to consider costs and benefits of the goals and actions that are contemplated in the recommendation sections ahead. All actions, including the programs, policies and projects in this document incur costs and result in benefits. While the Office of Energy & Climate Change did not have the resources or bandwidth to conduct a formal cost analysis of each of the recommendations in this report, it was one of several explicit criteria the Climate Council considered as part of each recommendation. Some overarching cost-benefit and economic considerations will help put the recommendations for climate mitigation action in this report into perspective.

Major investments in energy production, food production, transportation, or any type of infrastructure result in economic development and benefits. But the cost-benefit analysis for various alternatives will yield very different results; and we have alternatives.

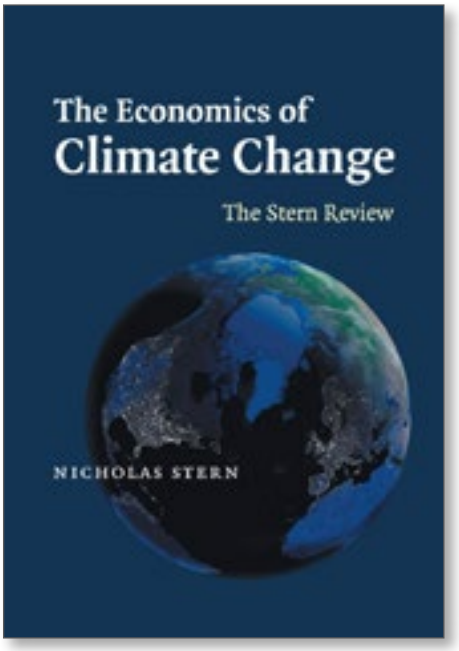
Fortunately, many clean energy resources today cost less than traditional fossil fuel energy resources, which are major sources of greenhouse gas emissions. This has been the case for energy efficiency resources for a long time. Meeting a kilowatt hour of electric energy demand through energy efficiency not only costs less than fossil fuel generation (or any electric generation for that matter), but it actually saves utility customers considerable money on their energy bills.

▲ Clean energy was one of the fastest growing sectors over the past decade nationally and worldwide. Solar employment reached more than a quarter of million in 2017 nationally. In 2018 Wisconsin had a little more than 3,000 people in solar jobs, ranking it number 24 in the nation according to The Solar Foundation.

The statewide energy efficiency program – Focus on Energy (FOE) – is a great example of this. For every dollar that ratepayers pay into the FOE program, utility customers see nearly a $4 benefit in the form of lower energy bills and avoided investment in infrastructure such as power plants and transmission lines. If you include economic benefits such as jobs created (delivering energy efficiency services), increased sales (of high-efficiency light bulbs and appliances), and increased disposable income (more money to spend on other things because

utility bills are lower), then each dollar in the FOE program resulted in about $6 in benefits to citizens and the economy in 2017.

An evaluation analysis of the economic impacts of the program showed that FOE created more than 1,000 jobs a year in 2015 and 2016 and the energy efficiency investments made in those two years will continue to create jobs – a total of approximately 8,770 jobs by 2040. Seven hundred of the jobs FOE created in 2015-16 were manufacturing jobs. The study further showed that FOE investments in 2015 and 2016 over the life of the measures or equipment installed, will cumulatively result in $1.3 billion in electric bill savings, $590 million in gas heating bill savings, $1.7 billion in increased sales of energy efficient equipment, a $370 million increase in personal income, and a cumulative net economic benefit of $760 million. This statewide energy efficiency program is a major economic development engine for Wisconsin. There is no reason that a county-level efficiency program couldn't do the same for Dane County.



As we think about the costs and benefits of investments in the transition to a clean energy economy, it makes sense to consider the environmental and quality-of-life costs, particularly in the context of a climate action plan. There have been several studies conducted looking at the cost of mitigating climate change and the cost of doing nothing about climate change. One of the earlier and best known was conducted in 2006 by the British economist Nicholas Stern. Known as the *Stern Review on the Economics of Climate Change,* the 700-page report concludes that climate change will have an enormous adverse economic impact on the global economy if left unchecked, equivalent to losing five percent of the global gross domestic product (GDP) each year, forever. At higher levels of warming, the loss could be as high as 20% of global GDP. The report finds, on the other hand, that early action with investments to mitigate climate change would be money well spent and would avoid some of those losses. The benefits of strong, early action on climate change greatly outweigh the costs.

More recently, The Economist Intelligence Unit published a study entitled *The Cost of Inaction: Recognizing the Value at Risk from Climate Change.* Addressing the finance industry, the study attempted to estimate the risk climate change poses to the global stock of manageable assets. Researchers found the current

(2015) stock of manageable assets to be an estimated $143 trillion (in US dollars). The study concluded that the expected losses to those assets from climate change are $4.2 trillion – roughly equal to the value of all the world's oil and gas companies, or the entire GDP of Japan. They further found that the warming of 5 °C would result in $7 trillion in losses and 6 °C could lead to a $13 trillion loss – roughly 10% of the global total. Another key finding was that from a public-sector perspective, a 6-degree warming represents losses worth $43 trillion – 30% of the world's manageable assets.

Recognizing the inherent uncertainty in the IPCC's modeling, one of the study's reviewers, Nick Robbins, stated "We wouldn't get on a plane if there was a 5% chance of the plane crashing, but we're treating the climate with that same level of risk in a very offhand, complacent way."

Another recent analysis of this type was performed in 2015 by Citi GPS (Global Perspectives & Solutions), the research arm of Citigroup, which is an international financial services company based in New York. The study, called *Energy Darwinism II*, was written by a team of 10 economists and analysts and compares two scenarios, one a business-as-usual path where we don't make a concerted effort to address climate change, and the other a low-carbon path needed to keep warming to, or near, 2 °C (the IPCC's recommendation prior to their 1.5 degree report released in October 2018). The Citi GPS team prefaced the analysis with this statement:

> We are not climate scientists, nor are we trying to take sides in the global warming debate, rather we are trying to take an objective look at the economics of the discussion, to assess the incremental costs and impacts of mitigating the effects of emissions, to see if there is a "solution" which offers global opportunities without penalizing global growth, whether we can afford it (or indeed we can afford not to), and how we could make it happen.

The Citi analysis concluded

> The sums of money at stake in terms of investment in the energy sector are staggering – we estimate at $190.2 and $192.0 trillion between 2015 and 2040 for Citi's "Action" and "Inaction" scenarios respectively. The difference is marginal between the two scenarios.... However, going down the route of

> "Inaction" would lead to a reduction in global GDP which could reach $72 trillion by 2060 depending on temperature increase, scenario and discount rate used.

The amount of warming they predict would lead to a $72 trillion loss of global GDP is 4.5 °C. At 2.5 °C they estimate a $44 trillion loss and at 1.5 °C, a $20 trillion loss. These estimates were derived applying a discount rate of 0%. With a discount rate of 3% (approximately double the rate used in the Stern Review), the GDP losses were estimated to be $7 trillion, $16 trillion, and $25 trillion at 1.5, 2.5 and 4.5 °C respectively. None of these studies had the benefit of the IPCC's 1.5-degree report – the cost/loss numbers presumably would be significantly larger if they had.

If losing $25, $40, or $70 trillion of net GDP value in our economy is bad at the global scale, then it is obvious we need to invest in clean energy solutions at the Dane County or Wisconsin level. We don't have any commercially viable fossil fuels in the ground here; but we do have a wealth of energy efficiency businesses. We also have lots of solar and wind developers. Wisconsin sends over $10 billion out of the state every year importing fossil fuels such as gas, petroleum, and coal to meet our energy needs. By investing in clean energy alternatives, we will keep more of those dollars circulating in our local economy.

Health Benefits

Fourth National Climate Assessment on human health impacts in the Midwest:

> Climate change is expected to worsen existing health conditions and introduce new health threats by increasing the frequency and intensity of poor air quality days, extreme high temperature events, and heavy rainfalls; extending pollen seasons; and modifying the distribution of disease-carrying pests and insects. By mid-century, the region is projected to experience substantial, yet avoidable, loss of life, worsened health conditions, and economic impacts estimated in the billions of dollars as a result of these changes. Improved basic health services and increased public health measures– including surveillance and monitoring–can prevent or reduce these impacts.

The Dane County Public Health Department, or Public Health, Madison & Dane County (PHMD),developed a climate change and health white paper recently that identified adverse health consequences in Dane County as a result of climate change including:

Climate Champions

A Youthful Climate Justice Hero Emerges

Stephanie Salgado, 18, a student at Memorial High School, waited her turn to speak at the youth-led climate rally in Madison.

"I felt my heart pounding, yet I held the microphone tight knowing that what I was about to say was right. I felt empowered, despite the hours that had gone by screaming through the day's climate fight. Reaching the podium along with my friend Sophie Guthier, allowed me to absorb the unbelievable sight. Little did I know as I spoke truth to power that my words would have such might."

▲ Stephanie Salgado speaks in front of the Capitol in Madison at a youth climate rally and strike on March 15, 2019. The demonstration was organized by the Youth Climate Action Team of Wisconsin and other groups.

On March 15, 2019, hundreds of students from the Madison area and around Wisconsin came out to take over the streets with leaders from the Youth Climate Action Team, and take back what belonged to them. Many of them, involved in their first protest, were afraid, but Stephanie was trained. Her determination was strong after months of contemplating the scary future of the planet she was inheriting. A few months later she was surprised by a phone call.

With that call she was appointed by both Lieutenant Governor Mandela Barnes and Governor Tony Evers to be a member of the state's Climate Change Task Force. The mission of the Climate Change Task Force is to advise the Governor on the most pragmatic ways to mitigate the effects of climate change. Stephanie at first questioned her potential and her ability as a UW Madison freshman. However, she soon realized that this isn't about her. It is about her community's goals. It is about giving a voice to the ones that have been silenced in the past. It is about representing the collective action of her community.

"I may have once been afraid to speak up due to my lack of enunciation and pronunciation as an immigrant, but nowadays, more than ever, I am anxiously waiting for my next opportunity to speak up and speak out for climate justice."

- Human performance and daily life
- Heat-related injury and death due to heat waves
- Respiratory disease and allergic disorders

▲ **Fig. 7.4:** Vulnerable populations. Examples of populations at higher risk of exposure to adverse climate-related health threats are shown along with adaptation measures that can help address sisproporionate impacts. When considering the full range of threats from climate change as well as other environmental exposures, these groups are among the most exposed, most sensitive, and have the least individual and community resources to prepare for and respond to health threats. White text indicates the risks faced by those communities, while dark text indicates actions that can be taken to reduce those risks. *Source: EPA.*

- Vector-borne disease from ticks and mosquitoes
- Waterborne and foodborne disease
- Health impacts related to food and nutrition insecurity
- Reduced availability of drinking water

The PHMD Climate and Health Report also did an excellent job of describing the disproportionate climate-related health risk to vulnerable communities and populations, including communities of color. Vulnerable individuals can include the very young, very old, socially isolated, homeless, people with low

socio-economic status, individuals with chronic disease or disabilities, and those often affected by social and economic determinants of health outcomes: people of color, non-English speakers, indigenous groups and those facing discrimination due to gender or religion. These populations, the PHMD explains, are at increased health risk, in part, because they have fewer resources to adapt to climate change impacts; climate change exacerbates socioeconomic inequities which exacerbates health inequities.

Reducing GHG emissions and mitigating climate change will clearly have a multitude of health benefits by avoiding all the direct adverse health effects that we know climate change is causing. In addition, reducing fossil fuel use locally and regionally will also generate very significant co-benefits by reducing additional emissions, such as sulfur dioxide, nitrogen oxides, and particle pollution that have adverse local impacts.

EPA's Clean Power Plan, while only in effect for a very short time, produced many benefits including a great deal of modeling and analysis. EPA estimated that a 30% reduction of carbon emissions (from a 2005 baseline) by 2030 would cut hundreds of millions of tons of carbon pollution, hundreds of thousands of tons of particle, sulfur dioxide, and nitrogen oxides. They further estimated that these emission reductions would prevent anywhere from 1,500 to 3,600 premature deaths and 70,000 to 90,000 asthma attacks in children. These estimated health benefits were limited to the elimination of power plant emissions. In Dane County, the elimination of emissions from gasoline and diesel-powered vehicles would also be a major driver of health benefits.

Key Message 1 from the Fourth National Climate Assessment – Human Health:

Climate Change Affects the Health of All Americans

The health and well-being of Americans are already affected by climate change, with the adverse health consequences projected to worsen with additional climate change. Climate change affects human health by altering exposures to heat waves, floods, droughts, and other extreme events; vector-, food- and waterborne infectious diseases; changes in the quality and safety of air, food, and water; and stresses to mental health and well-being.

Almost half of the projected deaths due to climate-related increases in ground-level ozone nationwide are projected to occur in the Midwest at an estimated cost of $4.7 billion (in 2015 dollars). The health benefits of reducing GHG emissions could result in economic benefits of hundreds of billions of dollars each year by the end of the century.

A very recent study conducted by a team of MIT researchers analyzed the impacts of renewable energy standards and carbon pricing policies on air quality and human health in rust-belt states including Wisconsin. The study found that existing renewable electricity standards produce a health co-benefit of $94 per ton of carbon dioxide reduced and that a carbon pricing policy would deliver health co-benefits of $211 per ton of carbon dioxide reduced in 2015 dollars.

These analyses look at the health impacts and associated cost savings of reducing emissions associated with ground-level ozone (smog) and other direct air pollutants that have respiratory disease impacts. Those are health impacts that have been studied in detail, and while not easy to predict and quantify, they are much easier than some, such as vector-borne diseases that are transmitted by animals, including mosquitoes and other insects.

The world's deadliest animal is not the grizzly bear, crocodile, or the great white shark. The world's deadliest animal is the mosquito. Mosquitoes kill approximately 700,000 people globally every year by transmitting diseases such as malaria, dengue, and yellow fever. These are all characterized as tropical diseases. Dengue is the most prevalent of all such diseases.

Dengue causes fever, joint pain, internal bleeding, and in some cases death. There are approximately 100 million cases of dengue fever, and approximately 10,000 deaths, across the globe each year: most of those in tropical countries such as India, Brazil, and several in central Africa.

Key Message 2 from the Fourth National Climate Assessment – Human Health:

Exposure and Resilience Vary Across Populations and Communities

People and communities are differentially exposed to hazards and disproportionately affected by climate-related health risks. Populations experiencing greater health risks include children, older adults, low-income communities, and some communities of color.

A 2019 paper published by the journal *Nature Microbiology* stated that the geographic range of dengue is expected to expand significantly as a result of climate change and urbanization including into "low-risk or currently dengue-free parts of Asia, Europe, North America and Australia." The study made projections for the spread of the disease in 2050 and 2080 under three IPCC climate scenarios and predicts an estimated 2.25 (1.27–2.80) billion more people will be at risk of dengue in 2080 compared with 2015. The study finds that "much of the southeastern USA is predicted to become suitable by 2050."

Adaptation & Resiliency

> Adaptation to climate change is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities.
>
> - Intergovernmental Panel on Climate Change
> Third Assessment Report, 2001

As Dane County continues to experience changing climate conditions, adaptation strategies must be used to offset potential social, economic, and ecological impacts. During 2013, Dane County governmental units formed the Dane County Climate Change Action Council as an adaptation planning exercise. Using future climate criteria (below), potential hazards, impacts, and adaptation strategies were identified and compiled in the report *Dane County Climate Change and Emergency Preparedness*.

▾ **Fig. 7.5:** *Source: Wisconsin Initiative on Climate Change Impacts - A1B scenarios for mid-21st century*

Temperature

Annual average temperature +6 °F
Average maximum temperature +6 °F
Annual peak temperature 110-112 °F
Twenty more days over 90 °F
Five hundred more cooling degree days
More frequent-longer heat waves

Precipitation

Annual precipitation +2"
Rainfall frequency and intensity increasing
Extreme rainfall event (6" in 24 hours)
Increased rainfall in winter and spring
Increased groundwater recharge
Changing snowfall rates and snow cover

Ongoing Climate Adaptation

Beginning in 2014, the Dane County budget included funding for climate adaptation strategies identified by the Climate Change Action Council, and Dane County departments have implemented plans to prepare for climate impacts upon public safety, transportation and other infrastructure, public health, and Dane County lakes and waterways. Examples include:

- $10,000 emergency sandbag program.
- $250,000 for the replacement of undersized road culverts.
- $75,000 to model the benefits and considerations for various lake level management scenarios to reduce flood impacts.
- $200,000 to analyze restoration of the Door Creek wetlands.
- $8 million for potential conservation acquisitions to improve the county's ability to reduce storm water run-off and improve water quality.

Adaptation and Mitigation

As Dane County moves forward with efforts to reduce its carbon footprint through the climate mitigation strategies described in this report, consideration must be given to additional opportunities to build resilience to climate impacts through adaptation. Office of Energy & Climate Change working groups have considered how future climate conditions might affect their recommended actions, for example the effect of increased demand for summer cooling during heat waves on renewable energy targets. Working groups have also considered how their recommendations can further climate resilience, such as how increased carbon sequestration on agriculture and forest land can improve soil health and thus rainfall infiltration.

As the climate changes, both carbon mitigation and climate impact adaptation strategies will continue to evolve together to take advantage of new understanding and increase resilience to future climate impacts. Some examples of opportunities to improve climate resiliency while reducing carbon emissions include:

- Using projected climate and weather extremes, such as changes in heating and cooling degree days and temperature extremes as criteria when evaluating energy mitigation programs.
- Prioritizing future land conservation efforts to both improve flood management and increase carbon sequestration.

- Identifying climate-appropriate tree species for urban forestry and rural afforestation.
- Making improvements to sanitary sewers to reduce carbon emissions attributable to increased pumping of stormwater inflow and infiltration.

Climate Adaptation Partnerships

Identifying and implementing successful adaptation strategies often requires viewpoints and expertise not found in county government. In the past, Dane County has actively partnered with Dane County UW-Extension for the public process around climate change impacts and adaptation, and the Wisconsin Department of Health Services for heatwave response and zoonotic disease prevention.

Moving forward, Dane County will partner with:

- The Wisconsin Initiative on Climate Change Impacts (WICCI) for access to the latest climate science and projections of future climate impacts.
- The Wisconsin Department of Natural Resources for natural resource management strategies to minimize impacts to streams and wetlands.

Bridging the Rural & Urban Divide

Rural Dane County contributes significantly to the County's overall economy. Dane County had the highest total corn (for grain) production of all 72 counties in the state in 2017. It also had the highest soybean production in the state. It had the third highest wheat production. It had the third highest milk production. It had the fourth highest number of cattle. In addition to one of the most robust farm economies in Wisconsin, rural Dane County has 27 County parks, five watersheds, 69 named lakes and ponds, 475 miles of streams, and more than 52,000 acres of wetlands. Rural Dane County has amazing natural resources, recreational opportunities, and economic production.

But rural Dane County, like all rural Wisconsin, has its share of challenges. In 2018 Wisconsin lost 638 dairy farms according to the Wisconsin Department of Agriculture, Trade and Consumer Protection; the biggest drop since records have been kept. As of August 2019, Wisconsin had lost 449 dairy farms, five of those in Dane County. According to a U.S. Department of Agriculture recently released

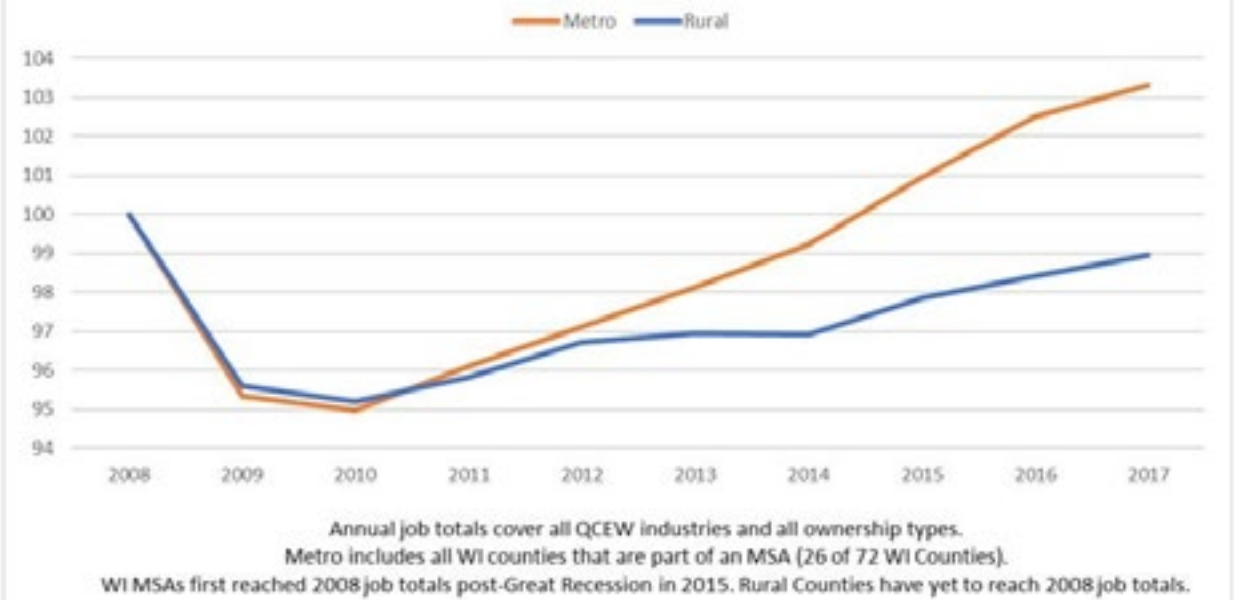
▲ Climate-change-driven flooding and droughts are having an adverse impact on forage crop production such as hay. These impacts, which result in higher costs for livestock feed, will increase more in the future but can be mitigated according to the best climate science.

report, Dane County has lost 142 dairy farms since 2007. There are many factors at play in forcing farmers out of farming; the price of milk is a major one.

Aside from losing farms, there are several factors creating obstacles to achieving broader economic potential, and in some cases, even basic services. A lack of high-speed internet access impedes economic development across much of rural Wisconsin, including rural areas of Dane County. A lack of resources to maintain roads and limited transportation options are also often cited as impediments in access to services such as health care, particularly for senior citizens and citizens with disabilities. The data in Fig. 7.6 shows that the job growth and economic recovery (since the 2008 recession) have lagged in rural areas relative to the urban and metro areas, and the gap continues to widen.

The clean energy investments recommended here hold tremendous economic development potential for rural Dane County. Most of the wind and solar power will be developed in rural areas. While we will prioritize mounting solar panels on as many rooftops as possible, the sheer volume of renewable generation needed to reach the goals in this plan, as well as the economics of attaining high

Fig. 7.6: Wisconsin metro area vs. rural job growth. Index 2008=100. *Source: Quarterly Census of Employment and Wages, Bureau of Labor Statistics.*



renewable percentages, dictate rural-based renewable energy systems, which inevitably means economic development and resources for rural landowners and rural governments. Badger Hollow Solar Farm in Iowa County, recently approved by the Public Service Commission, has an electric generation capacity of 300 megawatts and represents an investment of more than $360 million. This project will create an estimated 422 local construction jobs in Iowa County (plus 500 jobs elsewhere in the state), and another 17 long-term local jobs in Iowa County (and 24 long-term jobs elsewhere in the state).

Dane County has more than 10,000 acres enrolled in the federal Conservation Reserve Program which could host solar panels. In areas where solar arrays need to be connected to the grid and most land is in production, it will be critical for solar developers to understand the complex relationships of the various agriculture working lands and to talk to landowners early and often. It will be important for all stakeholders to acknowledge and understand the multiple and substantial benefits of wind and solar power on the landscape. In addition to critical GHG emission reductions, solar farms with native perennial plantings will replenish and build up soil fertility, retain water and reduce flooding, improve water quality by reducing runoff and nutrient loading, and improve ecosystem benefits. Maybe most interestingly, both solar and wind power will preserve farmland and preserve farms. There is no question that the high rent that solar and wind developers are able to pay farmers will give many family farms a

guaranteed income that will make the difference in allowing some farmers to continue farming.

UW-Madison political science professor and researcher Kathy Cramer identified and described Wisconsin's rural and urban divide in her highly acclaimed and deeply insightful book *The Politics of Resentment: Rural Consciousness in Wisconsin and the Rise of Scott Walker* published in March 2016. She described how the fact that poverty and unemployment are higher in rural areas and median income is lower influences the views and opinions in rural communities where there often aren't enough resources to maintain basic necessities, such as roads. I asked Professor Cramer what her best advice is for urban dwellers hoping to bridge the divide and if I had to sum up her response in a word it would be "listen." In a few more words she advised urban residents to spend time with rural residents, come with humility, and take time to listen and appreciate what you hear.

I've lived in rural Dane County for 13 years in two locations, and if you ask me the most important thing to know about rural Dane is the sense of community, the way neighbors help neighbors and communities come together for families in need.

Ecosystem Services

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Key Message A1:

> Nature is essential for human existence and good quality of life. Most of nature's contributions to people are not fully replaceable, and some are irreplaceable. Nature plays a critical role in providing food and feed, energy, medicines and genetic resources and a variety of materials fundamental for people's physical well-being and for maintaining culture.

On May 6, 2019, a body of 150 scientist experts (with input from 1,000 more) from 50 nations across the world issued a biodiversity assessment report that amounted to sounding a global ecological alarm for a biodiversity crisis. The group of scientists is The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (https://www.ipbes.net/). The conclusion: human activities, climate change being one of the most prominent, have pushed up to one million plant and animal species to the brink of extinction. The current rate of extinction, reflecting the decline of entire ecosystems across the globe, is ten to hundreds of times faster than the average rate of extinction

▲ Nearly a quarter of the 14,000 plants and animals in the Americas that have been comprehensively assessed are classified as being at a high risk of extinction.

over the past 10 million years. Without drastic action to conserve habitat, mitigate climate change, and change land use patterns, the rate of extinction will increase even more.

The ecosystem plays a critical role in providing critical benefits for people including food, energy, medicines, genetic resources, and building materials. The IBPES assessment report points out, for example, that an estimated 4 billion people rely primarily on natural medicines for health care and an estimated 70 percent of drugs used to treat cancer are natural compounds or mimic natural compounds. In addition, ecological processes are critical for maintaining clean air, safe drinking water, productive soils, a stable climate, pest control, and pollination of 75% of global food crops.

Climate change is one of several direct causes of ecosystem and biodiversity decline; but perhaps more importantly, climate change is exacerbating the impact of other major drivers such as overexploitation of resources, and land and sea use changes.

Although the Dane County Climate Council did not explicitly consider ecosystem benefits in the development of the recommendations that follow in this report, we

▲ Moths contain compounds that are useful in the treatment of diabetes, cancer, high cholesterol, and high blood pressure.

are proposing a process for doing so as these recommendations are fleshed out, implemented, and evaluated.

The framework for such consideration will be selected key indicators, each of which provides insight into the health and stability of the ecosystem in Dane County. A group of designated specialists and subject matter experts will determine the set of key indicators. Once the group describes the key indicators and their status, they can be leveraged to identify win-win actions that can be incorporated into the CAP implementation to stabilize and improve ecosystems within Dane County.

Step 1 The Office of Energy and Climate Change will designate members for an ecosystem integrity working group to include subject matter experts from the myriad of organizations and institutions in and near Dane County.

Step 2 The Office of Energy and Climate Change will engage the ecosystem integrity working group to review example ecosystem status indicators, revise

and add to the list, and calibrate for relevance in Dane County. They will then produce a final list of key indicators and the criteria used for selection.

Step 3 The group will present the framework of ecosystem status indicators to the Director of the Dane County Office of Energy & Climate Change, representatives of the former Dane County Council on Climate Change, and the Dane County Land and Water Resources Department for input.

Step 4 The Office of Energy & Climate Change and ecosystem integrity work group will review the policies, programs, and projects within the CAP and identify potential opportunities, and adjustments and challenges.

Step 5 The Office of Energy & Climate Change and its partners will track the key ecosystem status indicators through the implementation of the Dane County CAP to understand whether actions are having the projected beneficial outcomes. Progress reports should be incorporated into the overall performance review process for the implementation of the Dane County CAP. The ecosystem integrity working group will reconvene periodically (every one to two years) to revisit the ecosystem status indicators and modify them to reflect changed and emergent conditions and to make recommendations accordingly for adjustments to activities and initiatives.

Focusing on the integrity of the existing ecosystem through direct indicators of its health is also supportive of building our community's resilience toward the effects of climate change. Healthy wetlands, waterways, soils, prairies, forests, and buffer zones are all beneficial in reducing the consequences of a changing climate and extreme weather events. Conversely, if the Dane County CAP is successful, a primary measure of success would logically be ecosystem health, so it makes sense to track ecosystem health directly to determine the effectiveness of plans and actions taken.