2023 State Envirothon Current Issue Scenario
ADAPTING TO A CHANGING CLIMATE IN MINNESOTA

Background

You work for a recently formed company, called ***Resilient Communities LLC – the RC team***. Your young and energetic team is focused on helping communities take action to ***mitigate and adapt*** to a changing climate. Your company prides itself on being a diverse team that really listens to its clients and delivers excellent results.Your team has been discussing the National Climate Assessment for the Midwest and what the key messages mean for communities in Minnesota. Mitigation is about trying to avoid future climate change and adaptation is about trying to prepare for expected climate impacts now and in the future.

*Screenshot from National Climate Assessment for the Midwes*t

Your team has been invited to visit **Prairietown, Minnesota to present at a city council meeting**. Recently, the city leadership of Prairietown, including the city council and mayor, started a conversation with the county, school district, and other community partners about how they could ***all*** work together to prepare for a changing climate and be part of the climate solution!

This group of city, county, and school leaders call their group the ***Prairietown Progress (PTP)*** team. The PTP team decided they wanted to bring in outside experts, like you, to provide fresh insights about their concerns. Prairietown is fortunate to have a mixture of businesses, including heavy industry, an ethanol plant, a nice Main Street, and lots of agricultural land in production, mostly corn, soybeans, and some sugar beets are grown in the county. There are also several extremely large dairies nearby.

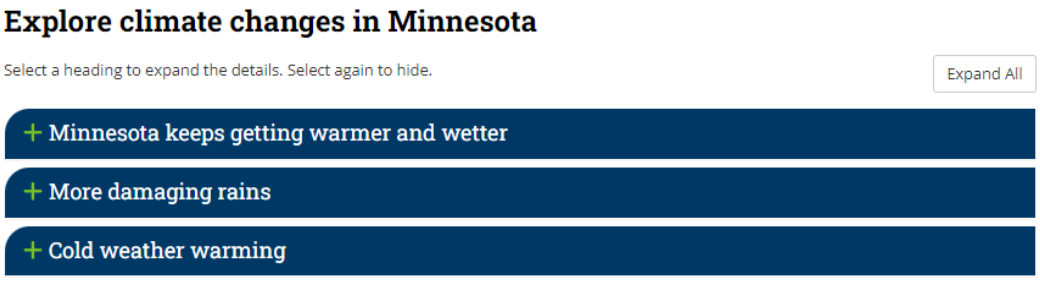
Prairietown is located in west central Minnesota in Stevens County. The city is home to nearly 6,000 people. According to the last Census, the county has a growing population of Latinos/Hispanics, nearly 10% of the population. There is also an important Native American population of a few percent. The town is predominantly white. There is good soil, strong wind, abundant sunshine, and ample water resources in Prairietown. Prairietown is also down the road from Morris, MN, which is the county seat.

The last couple of years have been challenging in Prairietown and the surrounding county. In 2022, the spring was extremely wet and planting was delayed. For several years, a few timely rainfalls helped keep the crops going, but mostly things have been really dry. Prairietown prides itself on its elm-tree-lined boulevards and beautiful ash-filled parks. In 2018 and 2020, big hail events that destroyed roofs of many homes. At the western edge of Minnesota, the wind is very strong and winters are cold. During the polar vortex in 2019, home heating bills stretched the finances of many families. After several days of -60 Fahrenheit windchills – a big boiler at the high school failed and required immediate replacement. During the polar vortex, all the snow in town was covered by a thin layer of soil – the snow even looked gray.

Extreme weather has always been a part of living in Minnesota, but the PTP team feels like things are getting more extreme. Things got really bad in spring 2022 when a derecho came through the region – stripping shingles off houses, and uprooting trees, especially pine trees, which fell on a lot of houses. Crop storage bins were ripped off foundations and flung into fields. Because of such extensive damage, it has taken months for people to get their roofs fixed. Many families have not been able to get roofs and barns fixed because there aren't enough local construction crews to fix the damage. Finding workers is a big challenge. One of the PTP team members remembers sitting in her garage watching a winter rainstorm in December a few years ago. The climate seems to be getting weirder.

Help Prairietown Progress Begin Its Climate Action Planning

1) The PTP team is a mixture of people with different political beliefs, backgrounds, and experiences. The team is mostly men, and they like to joke about their German and Norwegian ancestry. There are also a few women on the team. Not everyone on the team thinks that climate change is happening, but everyone agrees that Minnesota weather is extreme. The mayor of Prairietown has asked your team, Resilient Communities LLC, to attend a city council meeting. The city council members want to know the main climate trends in Minnesota and to sort fact from fiction. **Tell the city council and PTP team about the main climate trends in Minnesota?**



https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html

Climate changes observed and projected in Minnesota			
Climate Parameter	**Observations (through 2010s)**	**Projections (2041-2070)**	**Cause/Explanation**
Winter temperatures	**Increasing** rapidly, loss of cold extremes	**Continued increases expected** with narrowing of winter season	Greenhouse gasses absorb escaping heat, warming winters and nights most while shrinking hemispheric snow cover and "cold air reservoirs"
Rainfall	**Increasing** all seasons, more extreme events	**Increases likely** but timing and seasonality uncertain	More moisture available for precipitating weather systems
Snowfall	**Increasing**, more extreme events	**Decreases likely** but some extreme events	More moisture available for snow-producing weather systems, but warming of winter eventually decreases opportunities for snow
Heat waves & extreme heat	**No trend** through 2019	**Increases expected** by 2050, if not sooner	Warming to date concentrated in winters and nights, but heat waves more likely as seasonal and regional temperatures continue rising
Drought	**Decreasing** frequency, duration, coverage, and severity	**Increases possible** with longer dry spells and more "flash drought"	Wet trends have decreased drought regionally, but future precipitation increases projected to occur over fewer days, meaning longer dry spells
Tornadoes, hail, t-storm winds	**Trends unclear** or none observed	**Projections unclear**	Higher global temperatures increase thunderstorm size and rainfall intensity, but decrease wind shear required to for tornadoes, hail, and high winds

Screenshot from MPCA report: https://www.pca.state.mn.us/sites/default/files/p-gen4-18.pdf (p. 6)

Your Resilient Communities team has been following the work of another community-based partnership, called the Morris Model, also in Stevens County. Their community team did a conversation series focused on resilience planning. Session 1 presentations focused on the main climate trends in Minnesota, with Dr. Kenny Blumenfeld. And, one focused on the idea of climate adaptation and resilience in cities, with Dr. Heidi Roop.

2) The PTP team is worried about the tree canopy in the city. They want to know if the RC team has thoughts about what the city should do next. Many pine trees were lost during the recent derecho. A lot of elms in Prairietown have been taken down after getting sick with Dutch Elm disease. They have heard emerald ash borer is in Minnesota – but that the bugs are killed if it is really cold. **What are some high-level tree planting strategies you would recommend for the city that are climate-smart?**

3) The PTP team has discussed big goals for the community. One big goal is to cut greenhouse gas emissions by 40% in city operations. They want to know what options might help. They are looking at energy conservation ideas and how to make more clean energy locally. The RC team has many ideas for the city, school and other partners to consider.

    a) There are about two hundred 210 Watt high-pressure sodium light posts on Main Street in Prairietown. These light posts are on during night-time hours, about 12 hours a day. **The PTP team wants to know: How much could the city reduce their bills and energy usage (in kWhs) each year if they switched to 70 Watt LED lamps?**

    b) Prairietown has 6 cars in its fleet that get about 31 miles/gallon. The city is discussing converting 50% of its fleet to electric vehicles because three of the vehicles are old and having maintenance issues. Each of the cars in the fleet drives about 20,000 miles per

year – but the city could potentially move all their driving to just 3 cars – if they scheduled staff trips better. One member of the PTP team recently drove a fully-electric Chevy Bolt and really liked it. The Bolt had a 60kWh battery and could go 230 miles, around 3.8 miles per kWh. **The PTP team wants to know: Would purchasing electric cars lower greenhouse gas emissions for the city AND is it cheaper to fuel-up an electric car or regular gasoline car to go 230 miles?**

(Troubleshooting note: if you use the https://evtool.ucsusa.org/ – you need to CLICK on – "No, thanks, I just want to see the results" and then you will see more information.)

c) Solar photovoltaic (**PV**) panels **make electricity** and have dropped dramatically in price. Now, you can install solar PV systems for around $2.50 per Watt. City hall wants *to make* as much electricity as *it consumes* each year. City hall consumes about 18,000 kWh per year and pays about $0.10/kWh for electricity. The roof is big and could support 38 kW of solar PV. They also heard that their local utility is paying about $1500 per kW for solar PV projects, like this. This project could also benefit from the Minnesota net-metering law for projects under 40kW. **The PTP team wants to know: Would a 38kW solar PV system make as much electricity as city hall consumes each year?**

Your RC team frequently uses the National Renewable Energy Lab's online software program called PVWatts – it is easy to use and can tell you how much energy you can make with a solar PV installation. You just enter a few facts, like zip code, the tilt of the panels (45 degrees), enter how many kW the system is – and you can get an instant analysis of how much energy it will make.

Screenshot of PVWatts online software showing basic information to enter for a calculation.

d) Driving around Prairietown you see lots of ice dams on the houses. Many of the homes are older and probably not well-insulated. There are many ways to save energy in a home. Many residents are struggling to pay their energy bills. The PTP team wants to know: **Do you have any recommendations about how the Prairietown Progress**

team could help improve home energy conservation in the community and what kind of actions improve energy efficiency in homes?

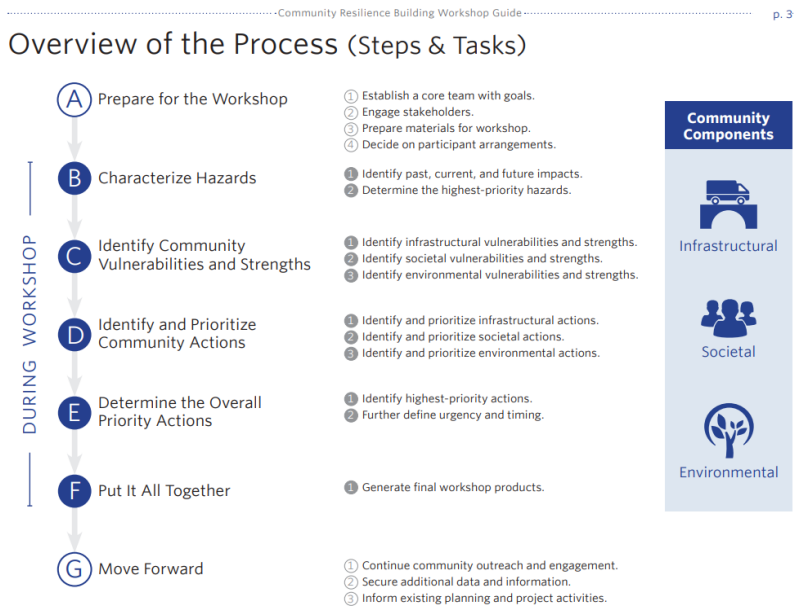
Screenshot from Minnesota Clean Energy Resource Team Single-Family Guide

4) The PTP team wonders if their community could be doing more to adapt to extreme weather. They are especially interested in learning more about community planning for climate adaptation and how farming can be more resilient to extreme weather. Your team doesn't have a lot of time at the city council meeting, so they would like your team to **respond to EITHER 4a OR 4b below. Select one.**

    a) The PTP team wants to know: **Does your team have any recommendations for how the community could adapt to these challenges? What ideas do you have for how the community could plan for greater resilience?**

Recently, the State of Minnesota completed its Minnesota Climate Action Framework planning document. **Goal 3 (page 41) is specifically about creating more resilient communities.**

The Morris Model team in Morris, MN used the Community Resilience Building approach to develop a community resilience plan for their community.



P. 3 of Community Resilience Building Planning Guide

b) The Prairietown Progress team is getting questions from farmers in the region. Farmers are saying they know that the weather is extreme and will likely get more extreme in the years to come. Recent wet years have made farming even more challenging. In some cases, farmers have seen big rains form gulleys in their fields, losing a bunch of topsoil. **Are there some suggestions your team has for farmers about any planting practices or field management practices they could use to manage their water challenges or make their farms more resilient?**

The USDA has been writing some about this topic. Farming challenges are getting some press attention in a lot of places, like here and there. As always, funding is a challenge to try new things. There are a LOT of best management practices (BMPs) in farming to improve soil health and water quality – and that can help make a farm more resilient.

5) The Prairietown Progress team is interested in engaging more with the public. The PP team wants more people to be involved and working towards these goals.The PP team has noticed that when they apply for state and federal grant applications, there are more questions asking how PTP team engages with different groups of people in their community to create a diverse team. **The PTP team wants to know: What are your suggestions for how Prairietown Progress can engage more community members in this climate work? What voices need to be amplified?**