JUNEAU'S CHANGING CLIMATE

& COMMUNITY RESPONSE

ALASKA COASTAL RAINFOREST CENTER

Overview

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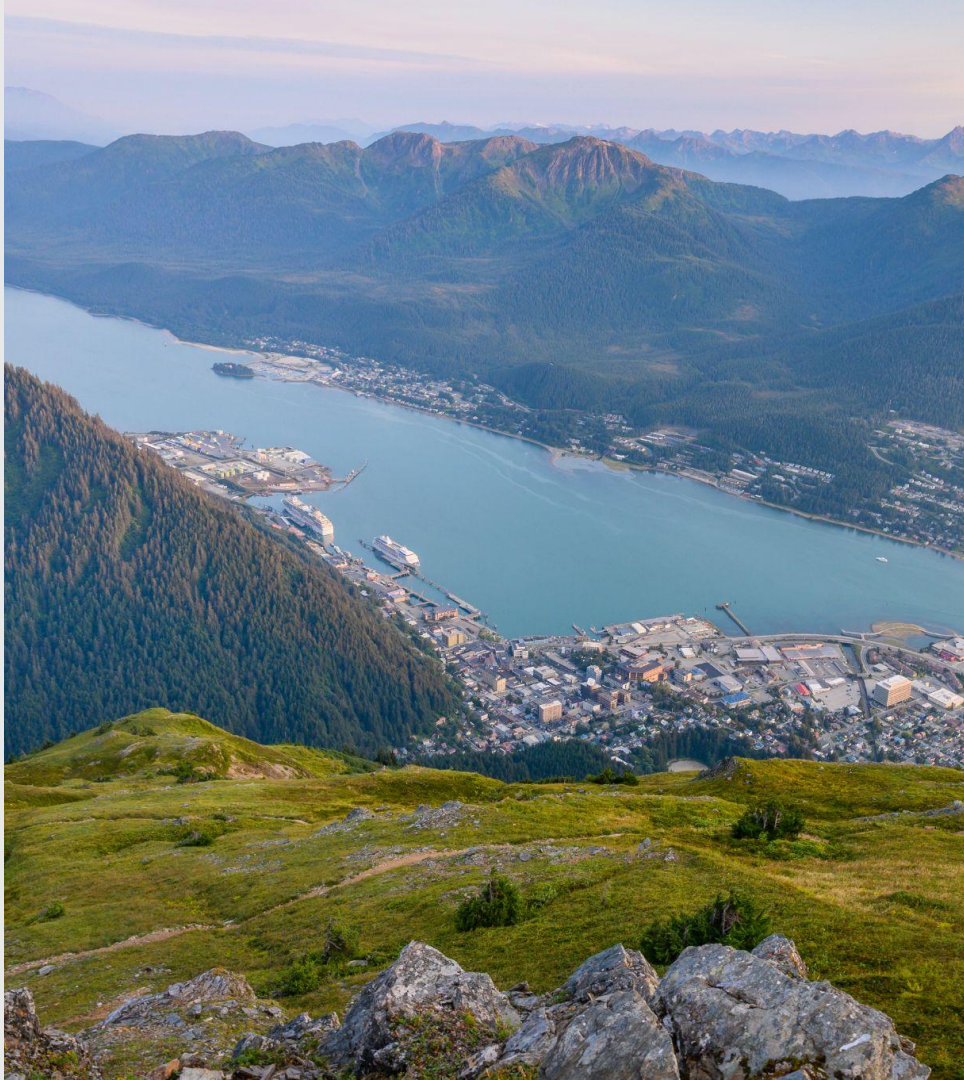
Questions & Discussion



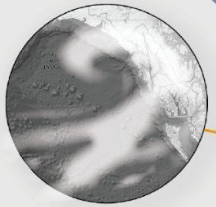
9 KEY MESSAGES

The information in this report can be summarized in nine key messages. These pages provide a visual display of complex climate data that can be used as a quick reference and guide to more in depth information throughout the report.

1. MORE PRECIPITATION

Juneau is experiencing a clear long-term upward trend of precipitation. The average annual precipitation has increased approximately 20 inches over the past 96 years.

Learn more in section A.2



2. RISING TEMPERATURE

Temperatures are generally rising, with significant increases in the winter and summer but much less change in spring and autumn.

Learn more in section A.3

3. LESS SNOWFALL

Continued warming can be expected to decrease the amount of snowfall near sea level. From 1940 to 2020, average winter snow accumulation at the Juneau airport followed a downward trend.

Learn more in section A.4

4. SURFACE UPLIFT AND SEA LEVEL RISE

Sea level rise is currently outpaced by land surface uplift caused by receding glaciers, but sea level rise may overtake land surface uplift later this century.

Learn more in section B.1

5. OCEAN WARMING

Warming sea temperatures are anticipated to greatly stress many parts of the ocean's ecosystems, such as marine mammals, fish, and seabirds, and may enhance algal blooms.

Learn more in section B.2

6. INCREASING OCEAN ACIDIFICATION

Declining marine pH will likely cause broad negative social and ecological impacts to marine ecosystems.

Learn more in section B.3

7. MORE LANDSLIDES

Landslides are expected to increase, as the climate becomes warmer, wetter, and characterized by more extreme precipitation events.

Learn more in section C.1

8. RESPONSE: LOWERING GREENHOUSE GASES

The City and Borough of Juneau has developed a climate policy and proposed implementing strategic climate actions to lower greenhouse gases by obtaining 80% of Juneau's energy from renewable sources by the year 2045.

Learn more in section M

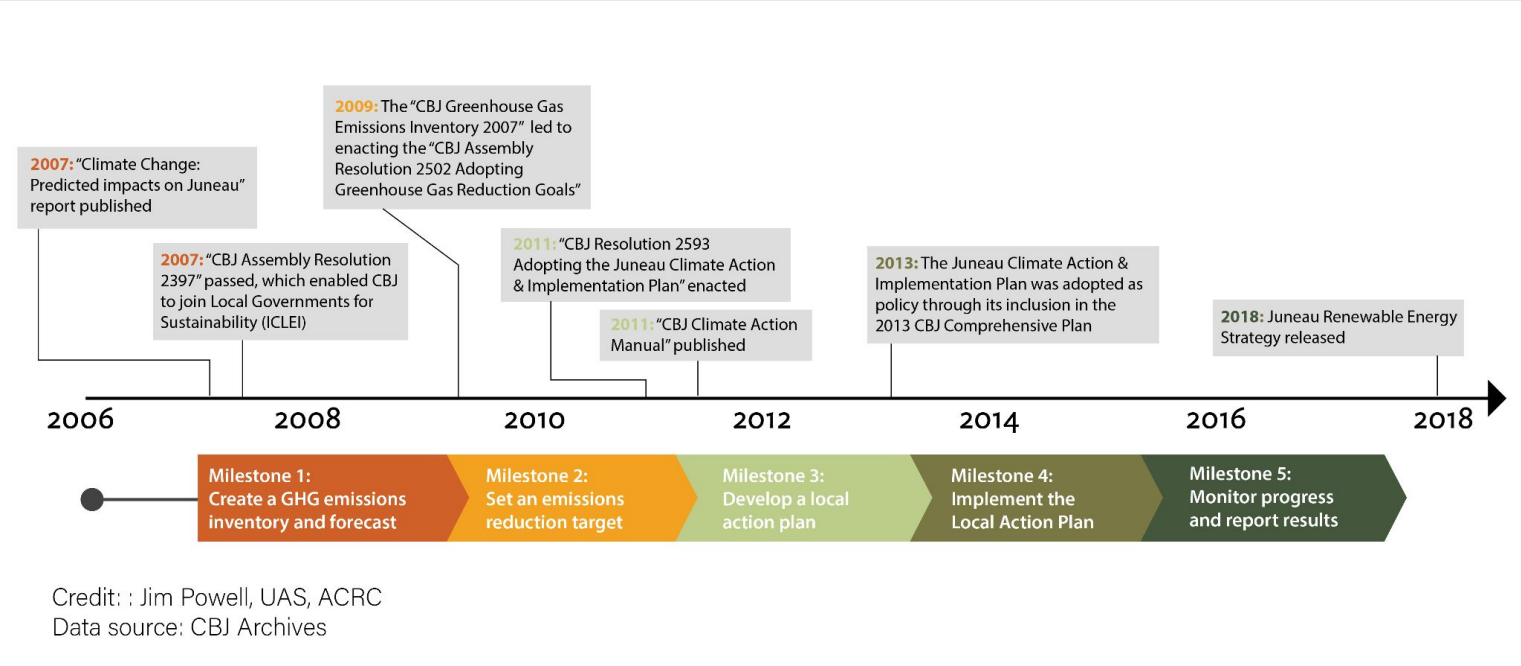
9. RESPONSE: RESIDENTS TAKING ACTION

Juneau's nonprofits and Tribal and local governments are taking action to mitigate and adapt to climate change.

Learn more in section N

Timeline of CBJ Climate Change Policies and Actions

CBJ's major policies and actions timeline with the five milestones the CBJ adapted from the International Council for Local Environmental Initiatives (ICLEI).

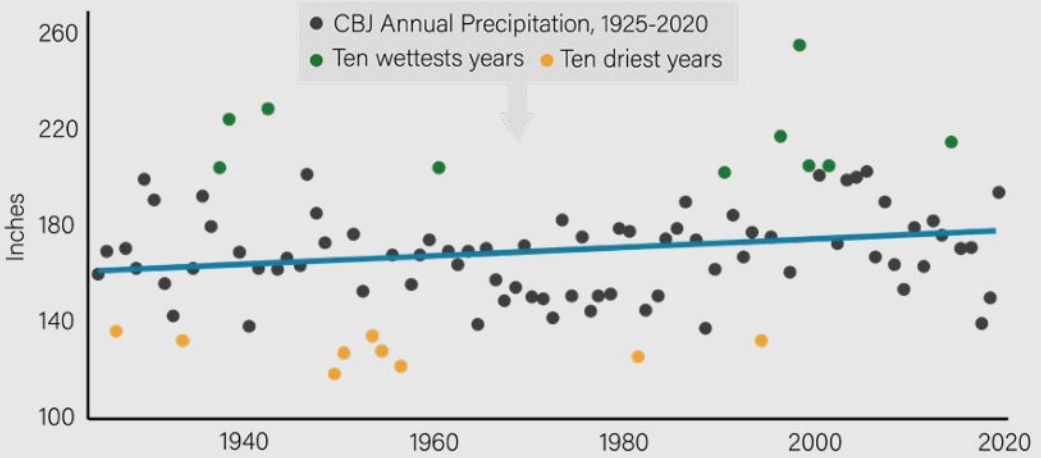


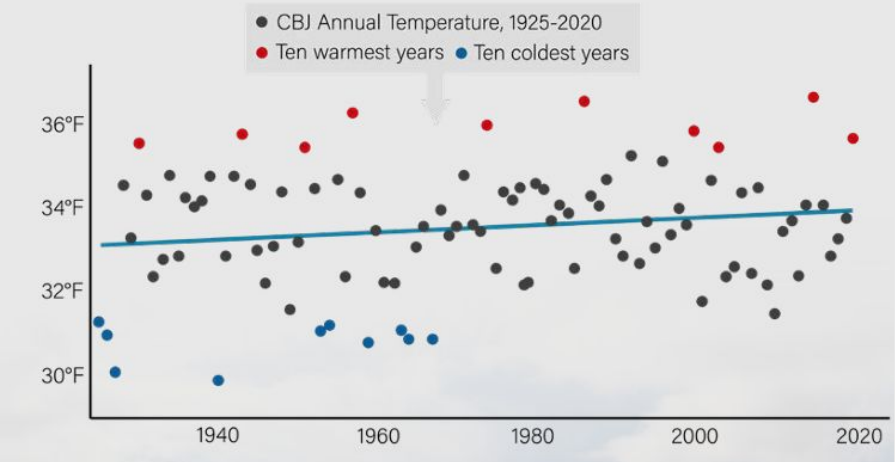
Credit: : Jim Powell, UAS, ACRC
Data source: CBJ Archives

Temperature and Precipitation

Key Points:

- Heavy rain most common in the fall (August to October) as are damaging high winds associated with large Pacific storms.
- Average annual precipitation have increased by 20” over the past 96yrs
- Short-term variations within this period.



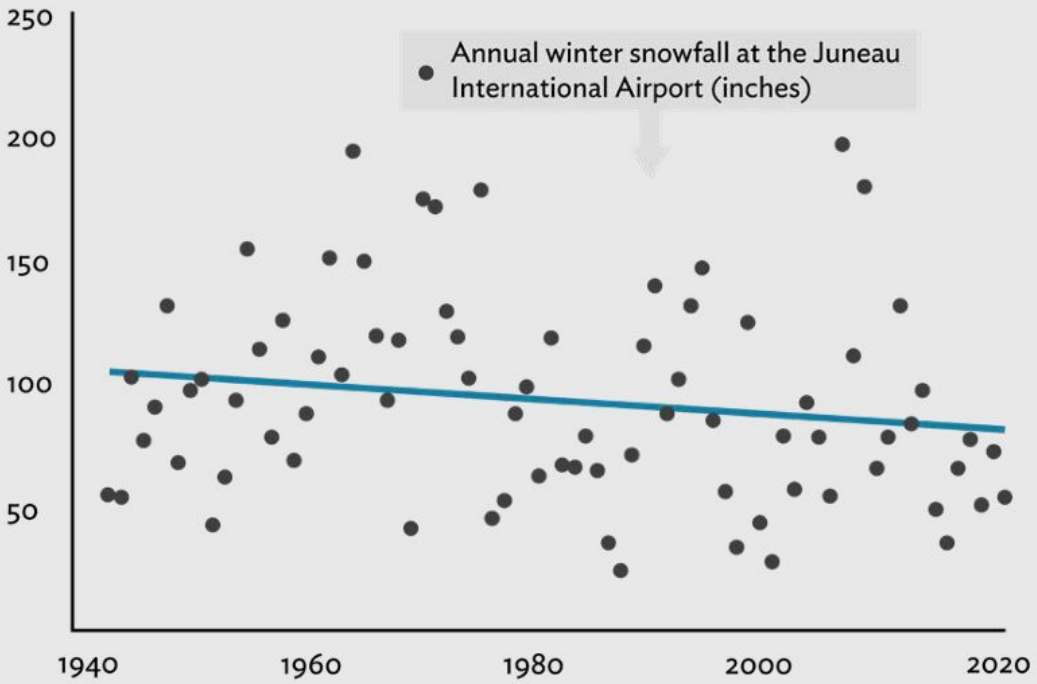


- Year-to-year and decade-to-decade variability will continue in the future even as the long-term trend of precipitation continues to increase.
- Temperatures are generally rising, with significant increases in the winter and summer but much less change in spring and autumn.
- Annual average temperatures have been slowly progressing warmer, mostly the result of the absence of extremely cold years in recent decades rather than an increase in temperatures in the warmest years .

Snowfall

Key Points:

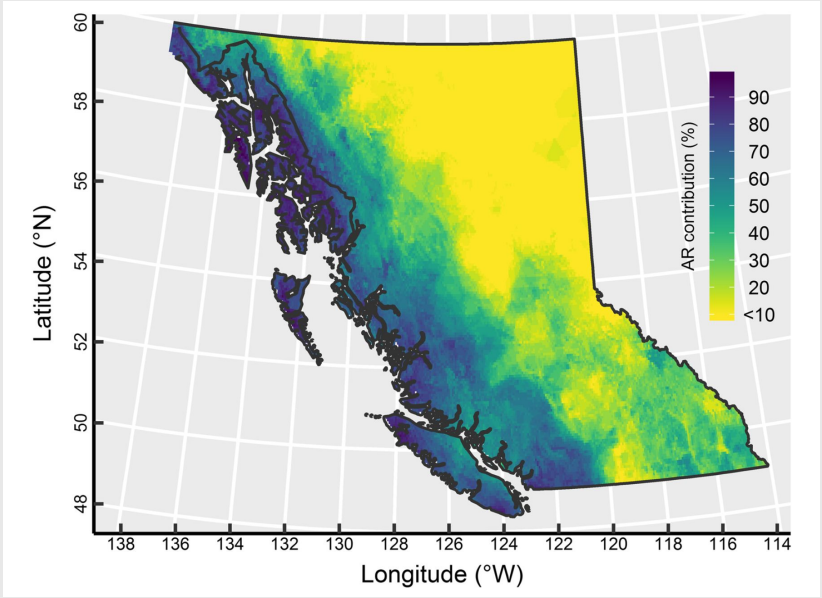
- Winter temps hover close to freezing of water, small changes in temp will have large effects on snow amounts.
- CBJ is getting warmer and more wet which has led to less snow at sea level
- Less snow will impact ecosystems (steam flows, water temp, glaciers, forest health) and winter recreation (Eaglecrest/nordic skiing).
- High elevations rarely get above freezing. Snowfall could increase as warmer air produces wetters storms
- Changing snowfall patterns to affect avalanche activity from lower snowfall to reduce risk to more rain-on-snow event could increase large avalanches.



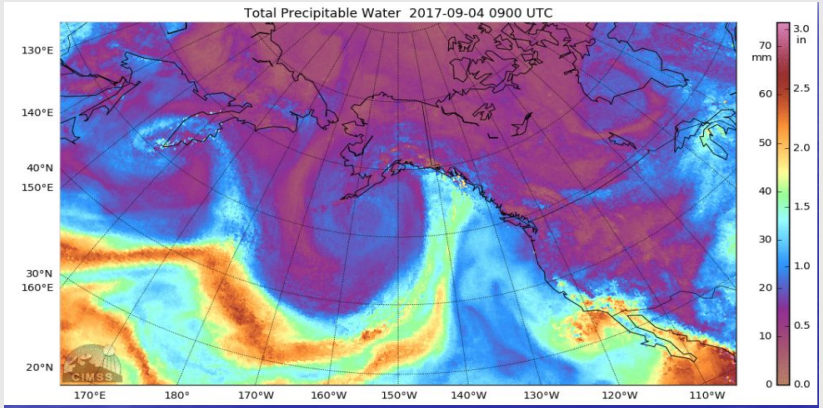
Atmospheric Rivers

Key Points:

- As the climate becomes warmer & wetter, there will be increased extreme precipitation events.
- Atmospheric Rivers impact CBJ with heavy precipitation, high winds and warm temps
- >80% of Atmospheric Rivers contribute to extreme precipitation
- More frequent Atmospheric River events=more extreme precipitation
- Fatalities and significant property damage due to atmospheric rivers
- Heavy precipitation events are linked to landslide activity.



1979-2012 average contribution of ARs to annual extreme precipitation.
Source: Sharma and Dery, 2020



Cooperative Institute for Meteorological Satellite Studies (CIMSS) University of Wisconsin, Madison MIMIC Total Precipitable Water image using Microwave satellites showing an AR impacting Southeast Alaska September 4, 2017.

Landslides

Key Points:
Regional landslides are usually linked to intense precipitation events

Landslides are more likely in areas that:

- receive heavy rainfall
- are steep
- have thick, weathered soils
- are disturbed by road building, logging, or development

The ground outside of the AWARE offices on Glacier Avenue is covered in debris after a mudslide. (Photo by Rashah McChesney)

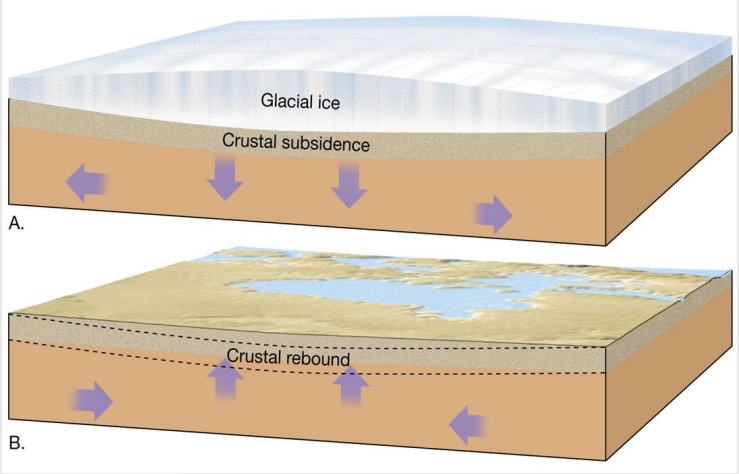
Lower Salmon Creek Rd Land Slide

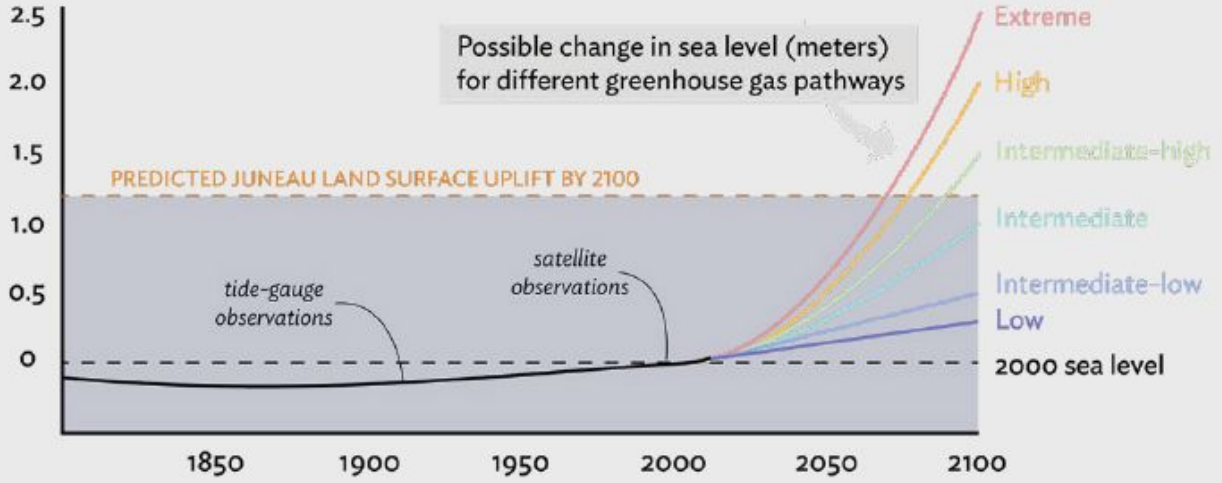
As warming continues, more extreme precipitation is expected, which in turn will lead to more landslides (+flooding) in sensitive areas

Sea Level Rise

As glaciers recede, land surface is uplifted due to isostatic rebound

Although sea level is rising, land is rising even faster, resulting in a relative decrease in sea level locally





Can Juneau's rise keep outpacing sea level?

- Only if humans limit greenhouse gas emissions this century

Mendenhall Glacier continues to retreat

View from the Mendenhall Glacier Visitor Center in **2018.**

Source: Mia Bennett/Cryopolitics

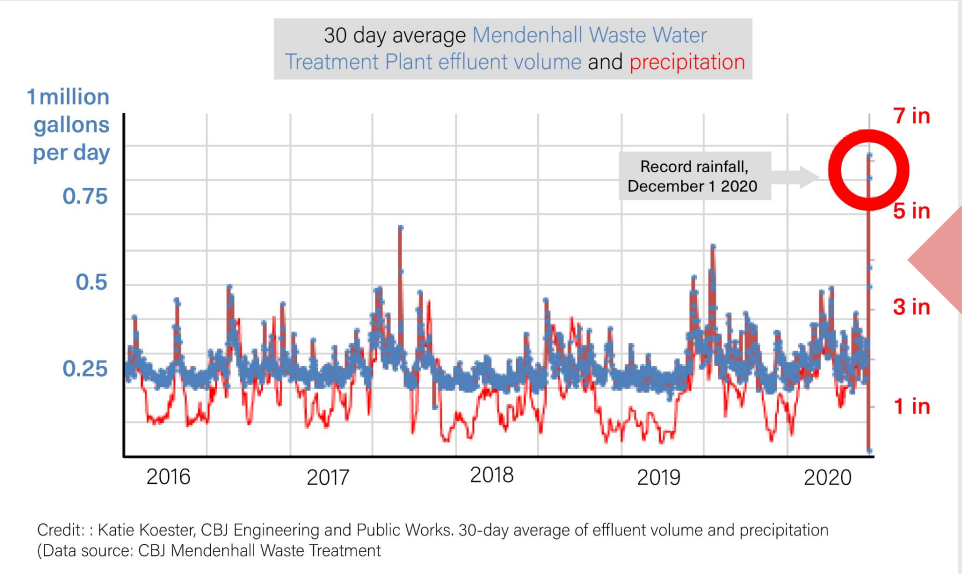
Artistic rendering of the view from the Mendenhall Glacier Visitor Center in **2040**, based on the mid-range thinning rate scenario.

Source: Amber Chapin, Michael Penn

Upgrading infrastructure and mitigation

Juneau's storm drain system is not built to withstand extreme events

- High precipitation events like the storms of October 2019 and December 2020 have overwhelmed Juneau's infrastructure. Both of these events represent 100-year storms, while Juneau's storm drain system is designed to handle a 25-year event.



Credit: : Katie Koester, CBJ Engineering and Public Works. 30-day average of effluent volume and precipitation (Data source: CBJ Mendenhall Waste Treatment

The December 1, 2020 storm brought the most rainfall ever recorded at the Juneau International Airport—just shy of **5 inches in 24 hours**. According to the Federal Emergency Management Agency (FEMA) damage report for the City and Borough of Juneau, the CBJ experienced **$4.7 million** in damage.

Upgrading infrastructure and mitigation

The 2011 CBJ Climate Action and Implementation included actions such as:

- Encouraging weatherization programs
- Updating the building code
- Encouraging all levels of government to reduce emissions in their operations
- Extensive public outreach and education

Hazard Assessment
In 2021, CBJ contracted for a hazard assessment and assessment maps for landslides and avalanches in the downtown Juneau area, including Mt. Juneau and Mt. Roberts
https://juneau.org/community-development/special-projects/landslide-avalanche-assessment

Renewable Juneau

Renewable Juneau is a non profit organization providing Information, education and advocacy to support local climate solutions– renewable energy, heat pumps, electric vehicles, and building efficiency – in Alaska's capital city.

Summary and recommendations

Energy

- Develop a suite of climate change indicators to be reported to the public on progress made toward Juneau's goal of 80% renewable energy use by 2045.
- Implement recommendations included in CBJ's Renewable Energy Strategy.
- Support centralized renewable energy plants such as district heating.
- Provide financial incentives for installing residential and commercial air source heat pumps.
- Adapt the 2021 International Energy Conservation Code (IECC) standards.

Large cruise ship emissions

- Implement the recommendations of the CBJ's Tourism Working Group, including the installation of shore power for 100% of large cruise ships.
- Limit the number of cruise ships in port at one time to five.
- Measure, monitor, and publicly report GHG emissions of large cruise ships while in port.

Summary and recommendations, cont.

Food security

- Increase awareness of known successful food growing and processing practices.
- Study and better understand the natural, economic, and societal impacts of climate change, such as food insecurity and supply chain issues, as well as the potential agricultural opportunities climate change may bring.
- Create initiatives to make local food growing more affordable.
- Maximize the use of inexpensive hydroelectricity for indoor and other controlled-environment food production.
- Identify and develop CBJ or other land for commercial agriculture and additional community gardens.
- As the regional hub, support local food production research, demonstrations, education, and incubation programs to positively impact current and future food cultivators throughout Southeast Alaska.

Acknowledgements

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