

Climate Change in New York State

Refined and Updated Projections



The New York State Energy Research and Development Authority (NYSERDA) has been studying, documenting, and modeling the impacts of climate change in New York State for several years. As public awareness of the impacts of climate change has grown, so have NYSERDA's efforts to better understand and forecast both gradual changes and extreme events. In 2011, NYSERDA released *Responding to Climate Change in New York State* (ClimAID), which provides climate projections for the state, as well as detailed information on New York's adaptation strategies and vulnerability to climate change. Working with the original ClimAID researchers and using the most up-to-date datasets, improved baseline scenarios, and the latest generation of climate models and emissions projections, NYSERDA has released *Climate Change in New York State: Updating the 2011 ClimAID Climate Risk Information* (the 2014 Update).

Climate Change Is Happening in New York State

Across the Empire State, temperatures are increasing; along the coastline, the sea level is rising. These changes are projected to accelerate because of increased concentrations of carbon dioxide and other greenhouse gases (GHGs) in the atmosphere. Throughout the Northeast, heavy rain events have become more frequent, and cold events have become more rare. These and other climate changes are projected to lead to increasing impacts across New York State's economy and natural systems. Not all of these changes will necessarily be gradual; when certain tipping points are crossed, impacts can increase dramatically. Impacts from climate change are already affecting every part of New York State—water, energy, agriculture, ecosystems, and other social and economic systems—and all its 20 million inhabitants.



CLIMATE PROJECTIONS

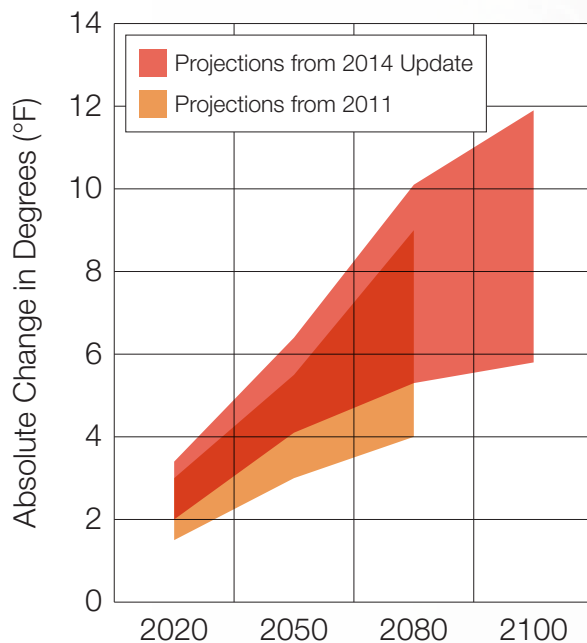
Projections for New York State

Updated climate models and methods have helped scientists refine their previous projections for higher average temperatures, changing precipitation patterns, and sea level rise in New York State. Scientists also project an increase in the frequency of extreme events, such as heat waves, heavy downpours, and coastal flooding.

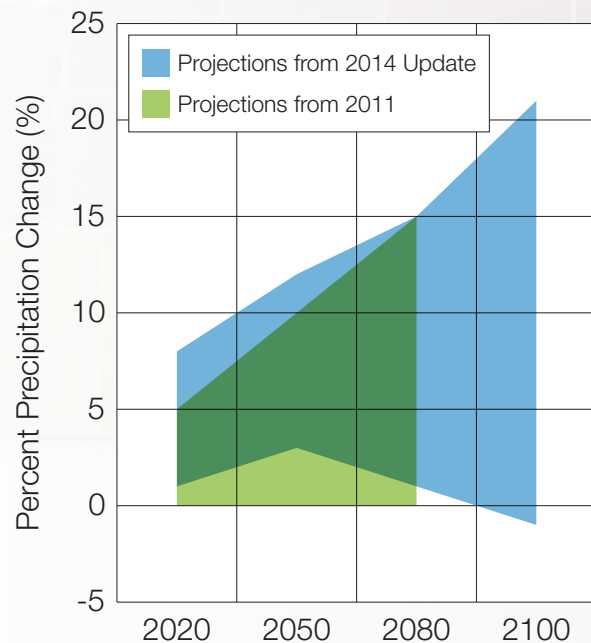
The 2014 Update highlights trends and projections for each of the seven regions in New York State for several climate variables: temperature, precipitation, extreme events, and sea level rise. Generally consistent with the 2011 ClimAID projections, these new projections represent a refinement based on updated science.



Comparison of 2011 and 2014 Temperature Projections



Comparison of 2011 and 2014 Precipitation Projections



Statewide values are computed as the lowest and highest value from the lower and upper bounds, respectively, of the middle-range of projections from across all seven regions. The middle-range of projections in 2014 are bounded at top and bottom by the 25th and 75th percentiles of data from all modeled projections. 2014 temperature ranges are rounded to the nearest half-degree and 2014 precipitation change percentages rounded to the nearest 1%. The middle-range of the 2011 data is computed as the middle 67% of values from model-based probabilities. 2011 temperature ranges are rounded to the nearest half-degree and 2011 precipitation change percentages to the nearest 5%.



Sea Level Rise

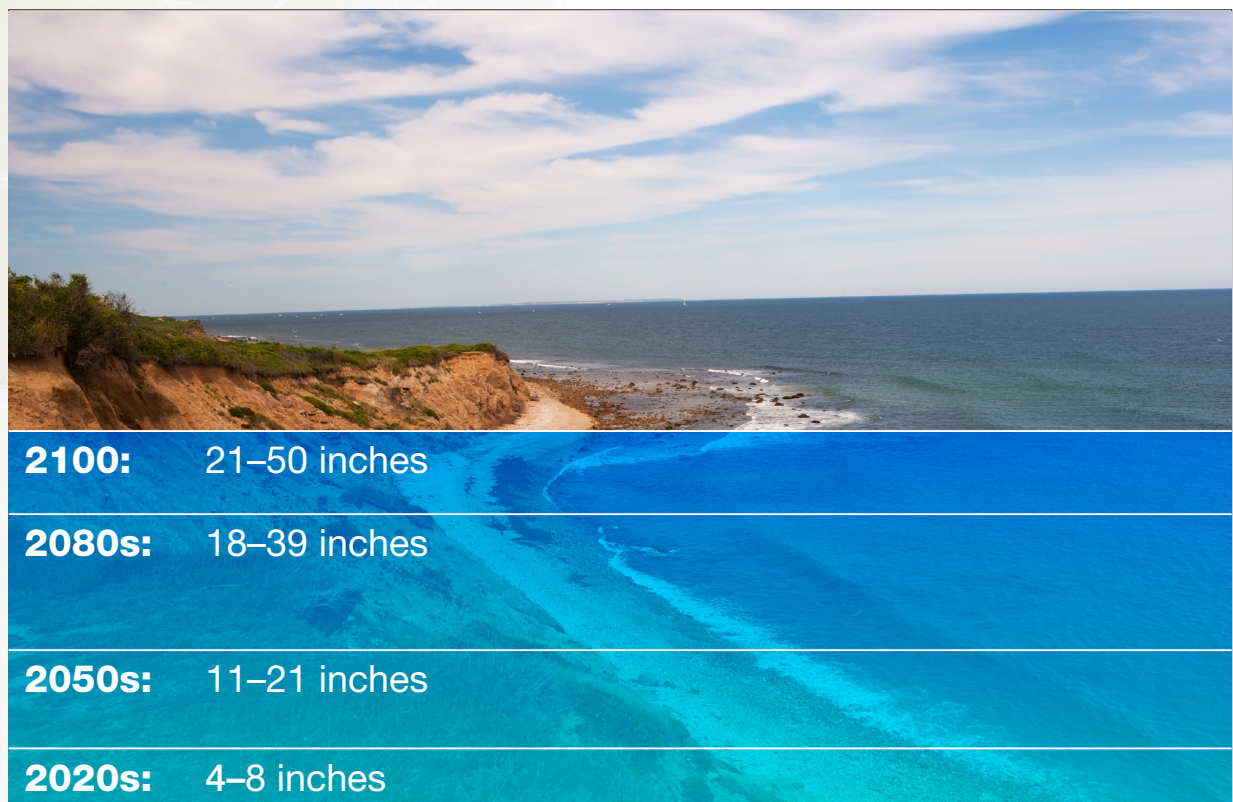
Researchers developed projections of sea level rise in the 2014 Update using a new method that combines climate model outputs with researchers' expertise and other literature, including the Intergovernmental Panel on Climate Change's Fifth Assessment Report. This method allows for analysis of variables that climate models cannot simulate at this time, such as changes in ice sheet dynamics.

Since 1900, sea level rise has averaged 1.2 inches per decade in the region. Much of that rise has been due to ocean water warming and expanding (known as thermal expansion). Recently, melting of land ice has become a comparable contributor to sea level rise. Because melting of land ice is expected to continue to accelerate, and the rate of acceleration is uncertain, the high-end sea level rise projections of 6 feet by 2100 cannot be ruled out.



Middle-Range Projected Sea Level Rise in New York City and Coastal Long Island

Incremental rise above 2000–2004 average baseline level



What Has Changed Since the 2011 ClimAID Report Was Released?

The 2014 Update uses the Coupled Model Intercomparison Project, Phase 5 (CMIP5) climate models, featured in the Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5). Many of these higher-resolution models include new features, such as how vegetation may respond to temperature and precipitation change, as well as overall improvements in the climate simulations themselves. Additionally, 35 climate model projections are used, rather than the 16 used in the 2011 ClimAID Report.

Much like the climate models, emissions scenarios have also evolved. The 2014 Update uses Representative Concentration Pathways (RCPs) from the AR5. The RCPs correspond to possible paths of greenhouse gas levels into the future. Previous emissions scenarios relied on specific assumptions about potential policies and economic situations in the future (e.g., high economic growth, growing use of low-carbon fuels) to create GHG estimates. In contrast, the RCPs do not depend on these assumptions and are therefore more flexible in terms of how both society and GHG levels might change over time. The 2014 Update uses two RCPs (known as RCP 4.5 and RCP 8.5), which are defined respectively as the low/mid and high ranges of expected GHG levels in the coming century.

The combination of the updated models, the use of the RCPs, and slight changes in methods yielded some changes in the results from the original ClimAID work. However, the changes are small compared to the inherent uncertainties in any long-term projections. The 2014 Update can be considered a refinement of the previous projections, and it amplifies many of the messages of the 2011 ClimAID report.

Additional Information

Visit nyserdera.ny.gov/ClimAID for more information and the full suite of updated projections:

- ▶ Horton, R., D. Bader, C. Rosenzweig, A. DeGaetano, and W. Solecki. 2014. *Climate Change in New York State: Updating the 2011 ClimAID Climate Risk Information*. New York State Energy Research and Development Authority (NYSERDA), Albany, New York.
- ▶ Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). 2011. *Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation*. Technical Report. New York State Energy Research and Development Authority (NYSERDA), Albany, New York.
- ▶ Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). 2011. *Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation*. Synthesis Report. New York State Energy Research and Development Authority (NYSERDA), Albany, New York.

