

Regulatory Impact Statement Summary

6 NYCRR Part 490, Projected Sea Level Rise

1. Statutory Authority

The statutory authority to promulgate this rulemaking is derived from the Department of Environmental Conservation's (Department's) obligations set out in the Environmental Conservation Law (ECL) Section 3-0319.

2. Legislative Objectives

The Community Risk and Resiliency Act (CRRA) was enacted with the purpose of ensuring that decisions regarding certain State permits, regulations, and expenditures include consideration of the future physical risks associated with climate change. Part 490 implements one component of this objective by providing a common source of sea level rise projections for consideration within the programs specified by CRRA.

3. Needs and Benefits

CRRA requires the Department and other relevant State agencies, as well as applicants to all permit programs regulated by the Uniform Procedures Act and several enumerated funding programs, to consider future climate risk, including sea level rise. CRRA also amends the State Smart Growth Public Infrastructure Policy Act, ECL Article 6, to add an additional smart growth criterion regarding mitigation of future climate physical risk due to sea level rise, storm surge or flooding.

In its 2017 Part 490, the Department adopted projections prepared for the New York State Energy Research and Development Authority's "ClimAID" report.¹ CRRA requires the Department to update these

¹ 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. <https://www.nyserda.ny.gov/climaid>.

regulations. These proposed updates will help to ensure the most up-to-date science-based sea level rise projections.

The methods used by Horton et al. (2014) to develop the 2014 ClimAID projections are identical to those used to generate sea level rise projections for the New York City Panel on Climate Change (NPCC) and are described in more detail in Horton et al. (2015²) and NPCC (2015³). The Department based its low, low-medium, high-medium and high projections for the three regions of the state on the 10th-, 25th-, 75th- and 90th-percentiles of ClimAID projection outputs, respectively. ClimAID assumed outputs were normally distributed, and the Department, in adopting the 2017 Part 490 medium projection as the 50th percentile of ClimAID's outputs, calculated the 50th percentile as the average of the 25th- and 75th-percentile outputs.

As adopted in 2017, Part 490 provided five sea level rise projections for each of three regions of the state: Long Island (Nassau and Suffolk counties), New York City and the Lower Hudson River upstream to Kingston, and the Mid-Hudson River from Kingston upstream to the federal dam at Troy.

In this Part 490 update, to ensure consistency in its regulatory and other programs, the Department intends to maintain the projection format used in the original Part 490 regulation. However, the 2020s projections will be replaced by projections for the 2030s. Projections for the 2050s, 2080s and 2100 will be included, as in the original regulation, with updates. The Department proposes to include new projections for the year 2150 in the updated regulation and to include a new projection that reflects a potential low-confidence, high-consequence rapid ice melt (RIM) scenario.

The current work to update sea level rise projections is being undertaken as part of the New York State Climate Impacts Assessment, funded by the New York State Energy Research and Development Authority

² Horton, R., C. Little, V. Gornitz, D. Bader and M. Oppenheimer. 2015. New York City Panel on Climate Change 2015 Report: Sea level rise and coastal storms. *Ann. New York Acad. Sci.* 1336:36-44. doi:10.1111/nyas.12593.

³ NPCC. 2015. Appendix IIB. Sea level observations and projections: Methods and Analyses. *Ann. N.Y. Acad. Sci.* 1336(1):116-150. doi:10.1111/nyas.12593.

(NYSERDA), which is the successive assessment to ClimAID.⁴ All references to ClimAID in the original 2017 regulation have been updated to reflect the new assessment in the proposed regulation. Advances in the IPCC approach to projecting sea level rise allow NYSERDA and the Department to more fully ground the New York State projections on those provided by the IPCC in its 6th Assessment Report (AR6).⁵

AR6 provides updated projections of global mean and regional sea level rise up to the year 2150. These projections were developed by assessing the individual contributions of the drivers of projected sea level change and combining them to project total change. See Fox-Kemper et al. (2021) for a full discussion of the methods used to generate the sea level rise projections provided by AR6.⁶

AR6 provides projections of global sea level rise for five shared socio-economic pathways (SSP) scenarios. Projections for these five scenarios include only processes for which there is medium confidence, including projections from ice-sheet models. AR6 also provides low-confidence projections for SSP1-2.6 and SSP5-8.5. These low-confidence projections integrate potential, but uncertain, ice sheet processes and marine ice cliff instability, about which a low level of agreement exists. The low-confidence projections have not been assessed as likely but are included in AR6 due to their potential high consequence. (See Bamber et al., 2019⁷, DeConto et al., 2021⁸.) In addition to the provided projections of global sea level rise, AR6 provides regional

⁴ New York State Climate Impacts Assessment. <https://nysclimateimpacts.org/>.

⁵ Fox-Kemper, B., H. T. Hewitt, C. Xiao, G. Aðalgeirsdóttir, S. S. Drijfhout, T. L. Edwards, N. R. Golledge, M. Hemer, R. E. Kopp, G. Krinner, A. Mix, D. Notz, S. Nowicki, I. S. Nurhati, L. Ruiz, J-B. Sallée, A. B. A. Slangen, and Y. Yu. 2021. Ocean, Cryosphere and Sea Level Change. In: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press.

⁶ op cit. Fox-Kemper et al. 2021.

⁷ Bamber, J.L., M. Oppenheimer, R.E. Kopp, and R.M. Cooke. 2019. Ice sheet contributions to future sea-level rise from structured expert judgment. *Proc. Natl., Acad. Sci. U.S.A.* 116 (23) 11195-11200. <https://doi.org/10.1073/pnas.1817205116>.

⁸ DeConto, R.M., D. Pollard, R.B. Alley, I. Velicogna, E. Gasson, N. Gomez, S. Sadai, A. Condron, D. M. Gilford, E. L. Ashe, R. E. Kopp, D. Li, and A. Dutton. 2021. The Paris Climate Agreement and future sea-level rise from Antarctica. *Nature* 593, 83–89 2021.

projections on a regular global grid and for individual tide gauge stations. Projections are based on a 1995 to 2014 baseline. These projections are described as medium confidence, and the 17th to 83rd percentile range is described as likely.⁹

The National Aeronautics and Space Administration (NASA) has made the AR6 projections available for visualization and download through its Sea Level Projection Tool. The NASA tool provides the 5th-, 17th-, 50th-, 83rd- and 95th-quantile projections, in decadal increments, from 2020 through 2150, for each of seven sea level rise scenarios. The NASA tool provides median gridded regional projections and projections at locations of individual tide gauges for the seven sea level rise scenarios, including for a region that includes eastern Long Island (latitude 41°, longitude -73°) and for the tide gauge at the Battery, New York City.¹⁰

To provide for consideration of a range of possible futures, including potential for low-confidence, high-consequence sea level rise scenarios associated with rapid melt of land-based ice, the Department proposes adoption of projections based on a blending of projections associated with three illustrative scenarios: SSP2-4.5, SSP5-8.5 medium-confidence and SSP5-8.5 low-confidence.

To generate New York State projections, researchers with the New York State Climate Impacts Assessment obtained the full distribution of IPCC projections, i.e., the 1st- to 99th-percentile projection, for three selected sea level rise scenarios for 2030, 2050, 2080, 2100, and 2150, for the Battery and the region that includes eastern Long Island. Researchers combined the 1st- to 99th-percentile model outputs, for the three scenarios, generating 297 values for each of the specified years, for New York City and eastern Long Island. They then used the resultant distributions to determine the 10th-, 25th-, 50th-, 75th- and 90th-percentile projections and adjusted them to solve for the decadal “middle” years, e.g., 2035, for consistency with the ten-year averaging used in the Part 490 projections.

⁹ op cit. Fox-Kemper et al. 2021.

¹⁰ https://sealevel.nasa.gov/data_tools/17, accessed March 12, 2023.

As the IPCC did not develop projections for the Mid-Hudson region, from Troy to Kingston, the Mid-Hudson projections are based on the New York City projections, with an adjustment to account for glacial isostatic rebound north from Kingston.

Confidence is low that ice-sheet processes will influence global mean sea level rise through 2100 under low-emission scenarios. However, ice-sheet processes in which confidence is low could lead to total global mean sea level rise substantially greater than considered likely by AR6.¹¹ Gornitz et al. (2020) argue that acceleration of ice mass losses and potential ice sheet instability may result in sea levels by the latter part of the 21st century that are higher than previously anticipated.¹² These authors provide an Antarctic RIM scenario for New York City for the 2080s and the year 2100. No projections reflecting a RIM scenario are available for the Long Island or Mid-Hudson regions or for beyond 2100. Due to the high degree of uncertainty of any RIM projection relative to the small differences among the three tidal regions described in Part 490, the Department proposes to apply the New York City RIM projection of Gornitz et al. (2019) to the Long Island and Mid-Hudson regions.¹³

Abstracts

Following are abstracts of reports used as the sources of projections of sea level rise for this rulemaking:

Gornitz, V., Oppenheimer, M., Kopp, R., Orton, P., Buchanan, M., Lin, N., Horton, R., and Bader, D., 2019. New York City Panel on Climate Change 2019 Report. Chapter 3. Sea level rise, in: *Advancing Tools and Methods for Flexible Adaptation Pathways and Science Policy Integration*. Rosenzweig C, Solecki W (eds). Ann.

¹¹ op cit. Fox-Kemper et al. 2021.

¹² Gornitz, V., Oppenheimer, M., Kopp, R., Horton, R., Orton, P., Rosenzweig, C., Solecki, W., Patrick, L., 2020. Enhancing New York City's resilience to sea level rise and coastal flooding. *Urban Climate*. 33: <https://doi.org/10.1016/j.uclim.2020.100654>.

¹³ Gornitz, V., Oppenheimer, M., Kopp, R., Orton, P., Buchanan, M., Lin, N., Horton, R., and Bader, D., 2019. New York City Panel on Climate Change 2019 Report. Chapter 3. Sea level rise, in: *Advancing Tools and Methods for Flexible Adaptation Pathways and Science Policy Integration*. Rosenzweig C, Solecki W (eds). *Ann. New York Acad. Sci.* 1439, 71-94.

New York Acad. Sci. 1439, 71-94.

Observations and modeling of global mean sea level rise suggest the possibility that rise in the latter part of the 21st century may be greater than previously anticipated. This potential high rate of rise could result in the event of ice sheet destabilization and rapid ice melt in the Antarctic under high greenhouse gas (GHG) emissions scenarios but is implausible under the lowest emission scenarios. This low-probability, upper-end scenario is highly uncertain due to incomplete knowledge about processes related to ice loss, including the speed with which these processes may proceed. Based on modeling of ice sheet-ocean behavior, this paper includes sea level rise projections for an Antarctic Rapid Ice Melt scenario of 6.75 ft. in the 2080s and 9.5 ft. for the Battery, New York City. The authors note that these projections provide insight into the magnitude of sea level rise that could occur after 2100.

New York State Climate Impacts Assessment.

With the exception of the Rapid Ice Melt scenario projections, the sea level rise projections used in the Part 490 update are taken from projections developed for the New York State Climate Impacts Assessment. The projections are included in the report,¹⁴ while the models, scenarios and calculation approaches are reported in Bader and Horton (2023).¹⁵ As described in this report, investigators based their updated projections on those developed for the IPCC 6th Assessment Report, which were based on CMIP6 models. Researchers selected three scenarios used by the IPCC: SSP2-4.5-medium confidence, SSP5-8.5-medium confidence, and SSP5-8.5-low confidence, which include a wide range of outcomes. IPCC projections were adjusted to match the format used in previous reports, including, 6 NYCRR Part 490.

¹⁴ <https://nysclimateimpacts.org/>

¹⁵ Bader, D., and Horton, R., 2023. New York State Climate Change Projections Methodology Report, accessed on October 12, 2023 at <https://nysclimateimpacts.org/wp-content/uploads/2023/09/Climate-Methodology-Report-09-21-23-final.pdf>.

4. Costs

Part 490 will not impose any costs on any entity because the regulation consists only of sea level rise projections and does not impose any standards or compliance obligations.

5. Paperwork

No additional record keeping, reporting, or other requirements will be imposed under this rulemaking.

6. Local Government Mandates

Part 490 will not create any mandates for local governments, including any additional recordkeeping, reporting, or other requirements.

7. Duplication

This proposal does not duplicate, overlap, or conflict with any other existing federal or State regulations or statutes.

8. Alternatives

Alternatives to this proposal include (1) No action, or not updating Part 490, (2) basing the projections in Part 490 on alternative analyses and scientific reports, (3) using an alternative projection format, and (4) including different scenarios in the analysis.

1) No Action – Not establishing Part 490 is not an available alternative because ECL § 3-0319 requires the Department to adopt a regulation establishing science-based State sea level rise projections.

2) Other Reports – No other available reports include projections specific to New York State.

3) Other Formats –To maintain regulatory consistency, the Department proposes to substantially maintain the format currently used in Part 490.

4) The Department's proposed projections are based on a combination of a scenario based on committed GHG emission reductions and scenarios based on continued heavy use of fossil fuels. Alternatives include reliance on scenarios in which emission reductions are significantly greater than current commitments, scenarios in which emission reductions are significantly less than current commitments, or simple extrapolation of historical sea level rise. Assuming emissions will be significantly greater than current commitments could potentially lead to over-investment in coastal protective strategies. Assuming emissions will be significantly lower than current commitments would fail to recognize that most nations are not complying with current commitments and, as discussed, would ignore indications of previously unanticipated sensitivity of land-based ice and ice cliffs to higher sea temperatures. Simple linear extrapolation of the long-term historical trend would mask the effects of increasing global temperatures and resultant higher rates of rise over the past several decades.

9. Federal Standards

No federal rules or other legal requirements are relevant to Part 490.

10. Compliance Schedule

There is no compliance schedule required by the establishment of Part 490 because the rule does not impose any compliance obligations on any entity.