New Data Shows Changes in Pluvial Flooding Based on Climate Projections

FREQUENTLY ASKED QUESTIONS TO BE PUBLISHED ON CLIMRR WITH DATA RELEASE ON NOV. 1

What pluvial flooding datasets are available on ClimRR?

Pluvial flooding occurs when precipitation intensity exceeds an area's ability to absorb the water. ClimRR's flood data projects pluvial flooding at historical and mid-century time periods, with the goal of depicting how broad climatic changes, including shifting precipitation patterns, may impact future exposure to non-riverine flood events. The data is provided in two ways: aggregated by watershed based on the Hydrologic Unit Code, Level 12 (HUC-12) and displayed visually in geographic information system (GIS) maps, and as raw data (not mapped) by 200m grid centroids.

The mapped HUC-12 data also include change layers that portray the absolute and percentage change in flood depths between the historical and future periods. Based on the 200m data, the aggregated HUC-12 flood depth data is intended to help users understand the potential direction and magnitude of flood changes over time under a changing climate. We encourage users to consider the level of change in projected flood impacts and supplement this information with other reliable sources of current flood information. Users of the raw 200m data should have experience working with flood data and understand the limitations of data based on climate projections.

How was this data produced?

ClimRR data is produced using "dynamical downscaling" – a process that uses a physics-based weather model to simulate the impacts of different emissions scenarios at high resolution, with projections to the end of the century. Dynamical downscaling explores interactive climate mechanisms, including those on the hydrologic cycle. ClimRR uses flood models and input terrain data that are of a lower spatial resolution while showing potential future risk, resulting in different depictions of flood-prone areas than FEMA Flood Maps. ClimRR's pluvial flood data is the first publicly available dataset of flooding projections using dynamically downscaled climate modeling with coverage across the contiguous United States.

Who might use this data?

ClimRR's watershed-scale flood data is useful for local planners, emergency managers, engineers, and other decision-makers to consider how flood risk environments may evolve under climate change, as well as the implications of these changes for people, infrastructure, and the economy.

How can this data be used?

Climate models are useful for giving us a plausible range of potential future outcomes and an understanding of how the future may be different from the present. ClimRR's flood data can help users identify how flood extent and flood depths might shift in a changing climate. Note that while climate science gives us a window into the future, there are numerous sources of uncertainty in climate modeling, such as unknown future emissions and their impact on future

flood conditions. Experts recommend a risk framing approach for making decisions that are based on circumstances with a lot of uncertainty, such as future climate scenarios and hazard models.

What should this data not be used for?
This data is informational and does not have regulatory purpose. This data does not have any bearing on the National Flood Insurance Program.

Why is the data here different than what is shown by FEMA Flood Maps?
FEMA Flood Maps depict current flood risk. They are created using hydrologic and hydraulic models as well as high-accuracy ground information. FEMA Flood Maps are used for regulatory purposes and determine where flood insurance is required and where minimum floodplain management standards apply. FEMA Flood Maps require a level of accuracy necessary to support regulatory actions and undergo rigorous due process and public review.

How should this data be used for planning?
This data is informational and does not have regulatory impacts. Because there are uncertainties in climate modeling, we recommend using multiple estimates of possible flood futures in planning. A risk framing approach starts with the action you are considering (e.g., a new building) and stress testing that action across multiple flood risk scenarios and/or plausible futures for location-specific projects. For example, projects with high consequences from failure to protect against flooding may require more risk-averse criteria than projects with lower consequences of failure. This Risk Framing approach is flexible and adaptable and will allow you to incorporate additional data as it becomes available.

- Risk Framing Steps:
  - Select several plausible future flooding scenarios.
  - Assess the possible impacts of each scenario on your project and look at a variety of options to mitigate impacts.
  - Weigh the impacts against the risk tolerance for the project and the ability to adjust the project to be more resilient over time.

- The implementing guidelines for the Federal Flood Risk Management Standard and the National Climate Task Force: Federal Flood Risk Management Standard Climate-Informed Science Approach (CISA) State of the Science Report both recommend this risk framing approach for looking at future flood risk.

- The U.S. Climate Resilience Toolkit has a resource on this topic: https://toolkit.climate.gov/content/decision-making-under-deep-uncertainty.

Will this data impact federal flood insurance rates?
No. This data does not have any bearing on the National Flood Insurance Program. ClimRR data communicates plausible futures, and insurance rates are based on current risk, not what the risk could be in the future. ClimRR data is not being used as an input to determine federal flood insurance rates and is not being used to determine where the purchase of federal flood insurance is mandatory.

How will this data impact FEMA flood mapping?
The ClimRR data is not being used to develop Flood Maps, nor it is being used to determine NFIP minimum requirements.

Does this data relate to the information in FEMA's National Risk Index?
At present, the National Risk Index relies on information in the National Flood Hazard Layer to determine flood hazard risk and does not include ClimRR data.

How does ClimRR relate to the implementation of Federal Flood Risk Management Standard (FFRMS)?
There is no relationship between implementation of FFRMS and ClimRR. The specific requirements for FFRMS are contained in Executive Order 13690 and the Implementing Guidelines. Appendix H of the Implementing Guidelines has an extensive discussion on climate informed science methods and data. See Federal Flood Risk Management Standard | FEMA.gov. Also, the National Climate Task Force issued an FFRMS interagency assessment of the state of science for climate informed future flood conditions in March 2023: https://www.whitehouse.gov/wp-content/uploads/2023/03/Federal-Flood-Risk-Management-Standard-Climate-Informed-Science-Approach-CISA-State-of-the-Science-Report.pdf.

How is data from other federal agencies (e.g., NOAA) used in ClimRR's methodology?
ClimRR's dynamically downscaled data uses three different global climate models (GCMs) as inputs, including the Earth System Model Version 2G, developed by the Geophysical Fluid Dynamics Laboratory at the National Oceanic and Atmospheric Administration (NOAA) and the Community Climate System Model (Version 4) developed by the Climate and Global Dynamics Laboratory at the National Center for Atmospheric Research (NCAR).

Data from federal sources were widely used in developing and validating ClimRR's climate models. Some of these include:

- The Weather Research and Forecasting Model, maintained by NCAR.
- Observed streamflow data from the U.S. Geological Survey's National Water Information System.
- The National Centers for Environmental Prediction-U.S. Department of Energy Reanalysis II data.
- The North American Regional Reanalysis (NARR) model produced by the National Centers for Environmental Prediction.

In addition to data from federal agencies, ClimRR's climate modeling is made possible in part due to computing resources available at the Department of Energy-supported Argonne Leadership Computing Facility and the National Energy Research Scientific Computing Center.

How does the inland flood data consider tropical cyclone events, such as Hurricane Helene?
The inland flood model does not explicitly model tropical cyclone events and only captures extreme events with a maximum 50-year return period. Flooding from Hurricane Helene, which was an extreme event with a recurrence interval beyond a 50-year event, would not be well captured by this data. The data can help identify the most vulnerable areas for pluvial flooding, which would also be impacted in extreme events such as Hurricane Helene.