IDF Curve Projections for the Delaware River Basin

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Harrison Tran – Cornell
Ben Eck – Cornell
Adrien Zheng – Cornell
Colin Evans – Cornell

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Co-Production

Methods
- Multi-model / downscaling
- Atlas-14

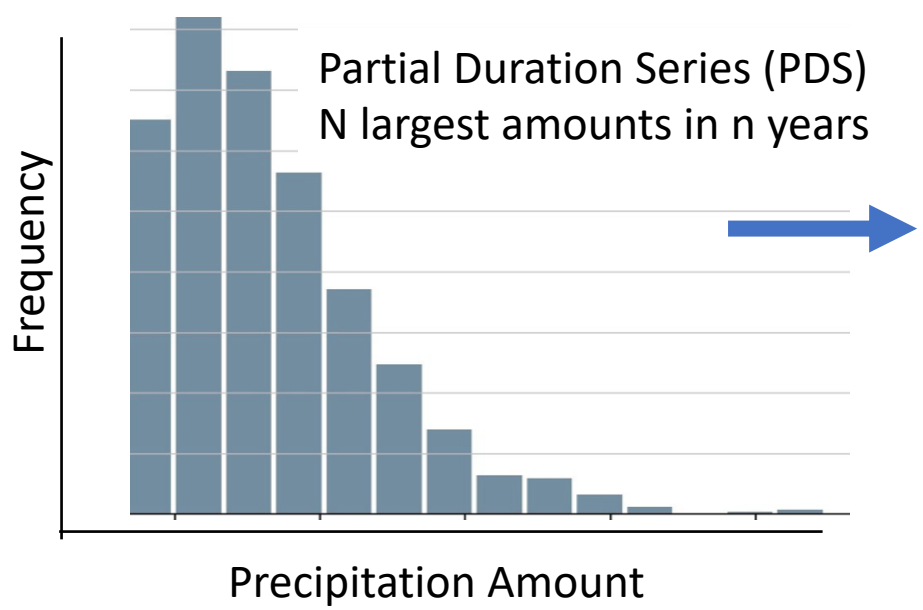
Spatial Scale
- Grid, municipality, basin, county

Uncertainty
- Scenarios
- Ensemble spread

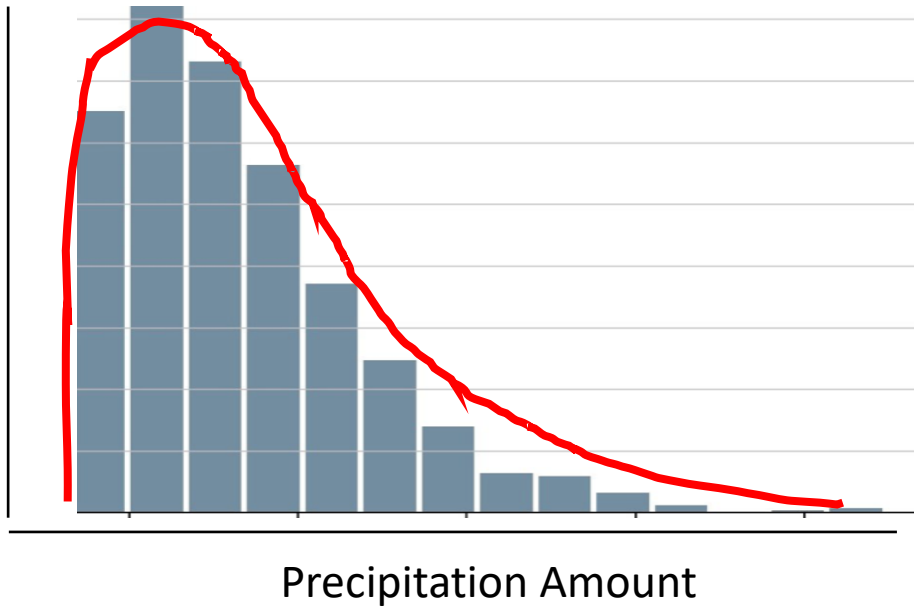
Website design and specifications

Methods: Partial Duration Series Fit

Sample (obs)



Statistical Distribution

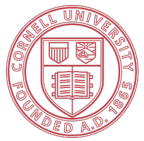


3 time periods x 47 model-downscaling combinations x 2 Scenarios

- 1950-1999 (model hist)
- 2020-2069
- 2050-2099

- 31 statistically downscaled LOCA (NCA method)
- 16 Dynamically downscaled

- RCP 8.5
- RCP 4.5



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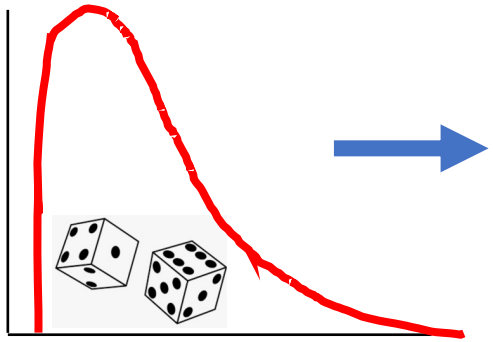
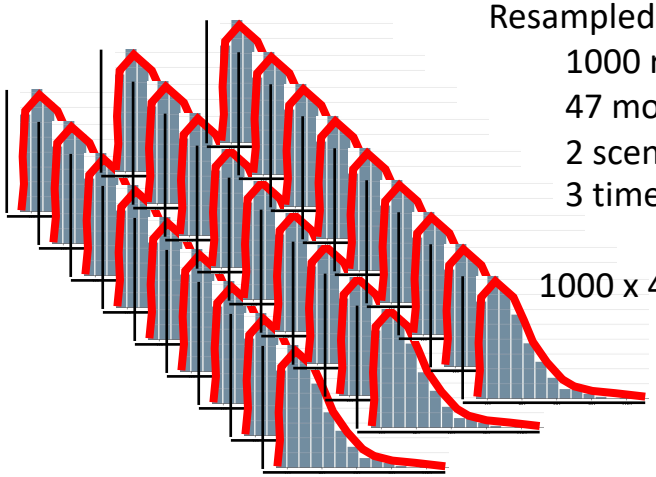
Methods: Resampled Confidence Intervals

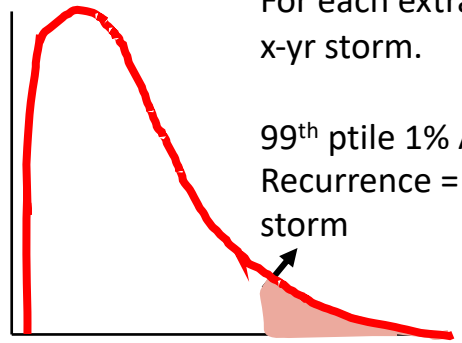




Resampled Distribution

1000 resampled PDS
47 models
2 scenarios
3 time periods

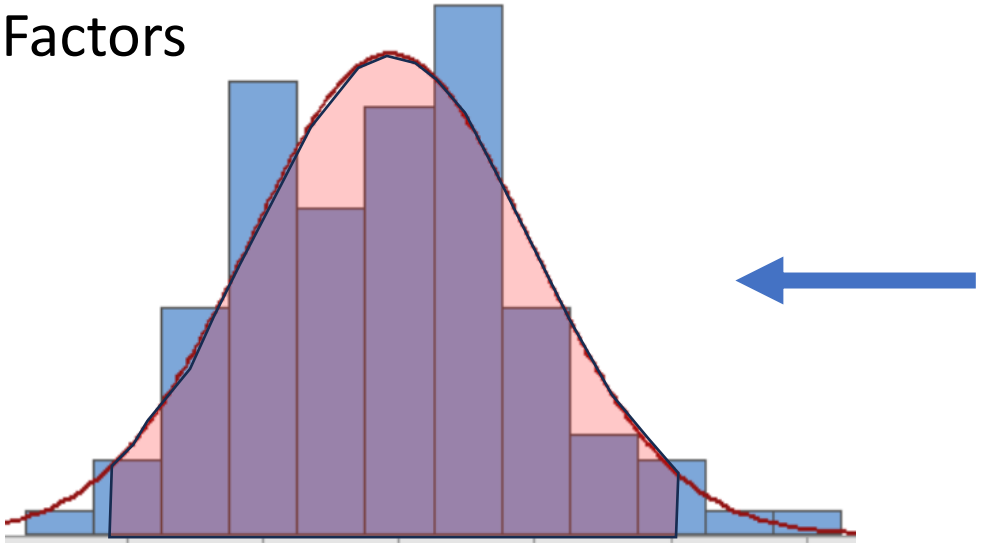
1000 x 47 x 2 x 3 = 282,000!



For each extract the x-yr storm.

99th ptile 1% Annual Recurrence = 100-yr storm

47,000 x-yr Change Factors



2.5 %

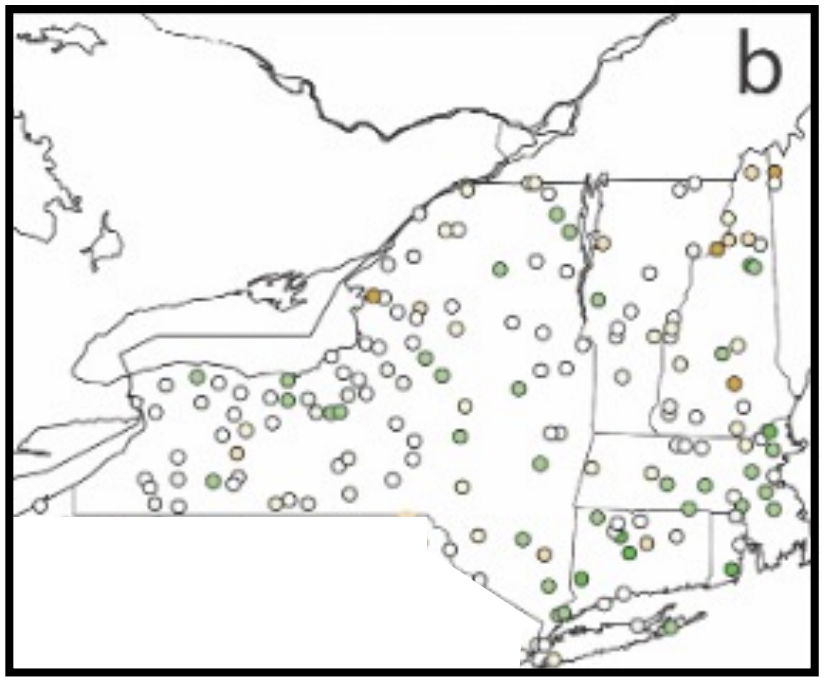
2.5 %

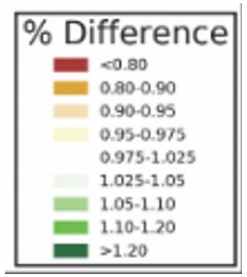
95% Confidence Interval

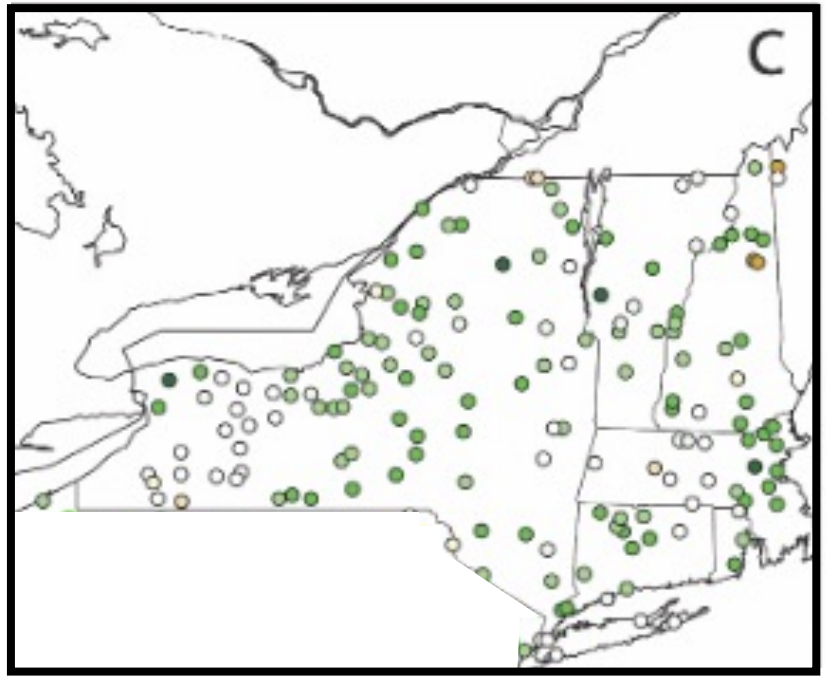
Change Factor

$$\frac{ARI\ Future}{ARI\ Historical}$$

How well Does Method Replicate Atlas 14?





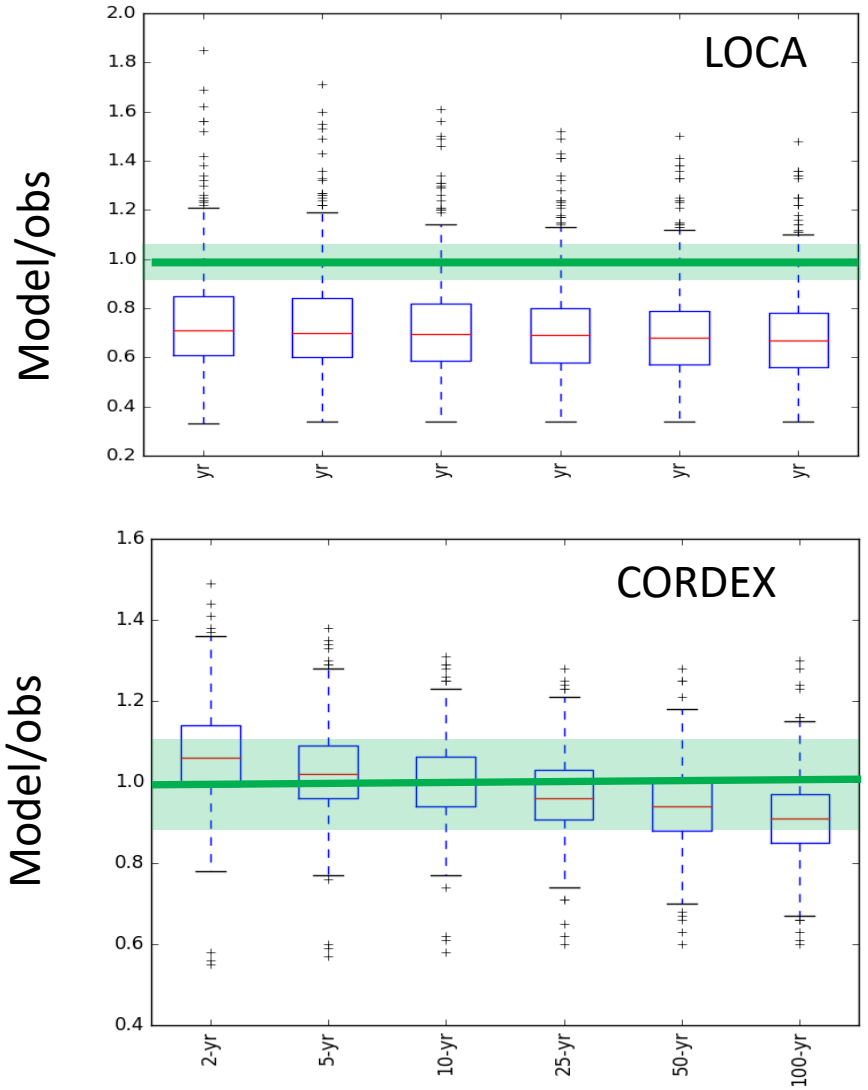


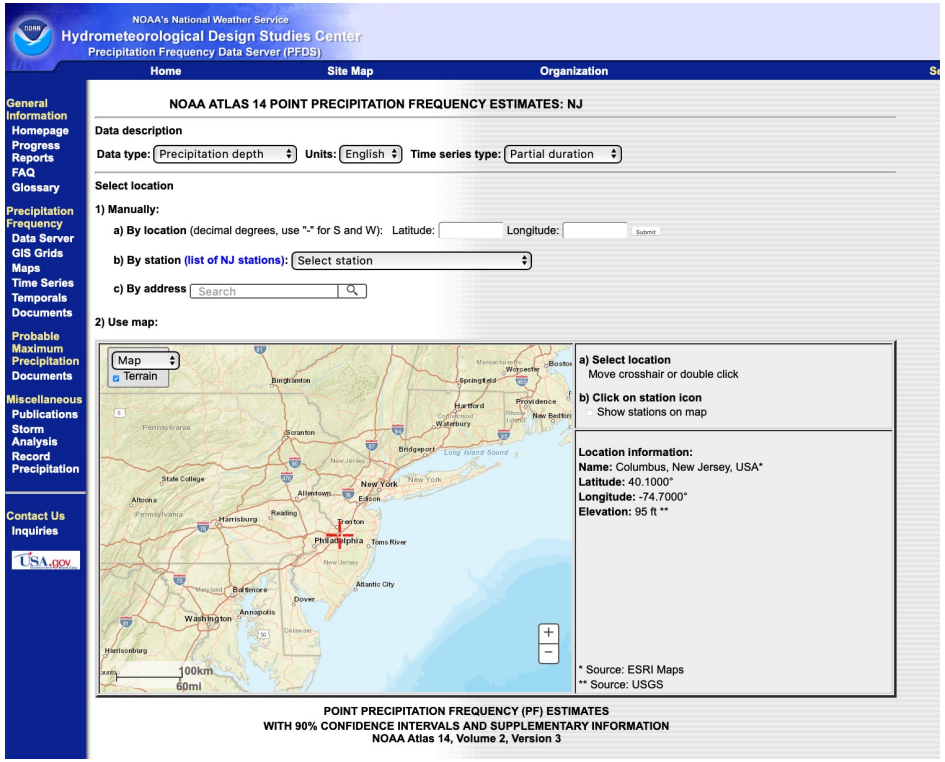
2-yr Storm

100-yr Storm

Needed to demonstrate that our base methods matched what the industry was accustomed to using

Why a Change Factor ?





Models Have a Bias

Bias is a function of return period

NOAA Atlas 14 is the go too data set

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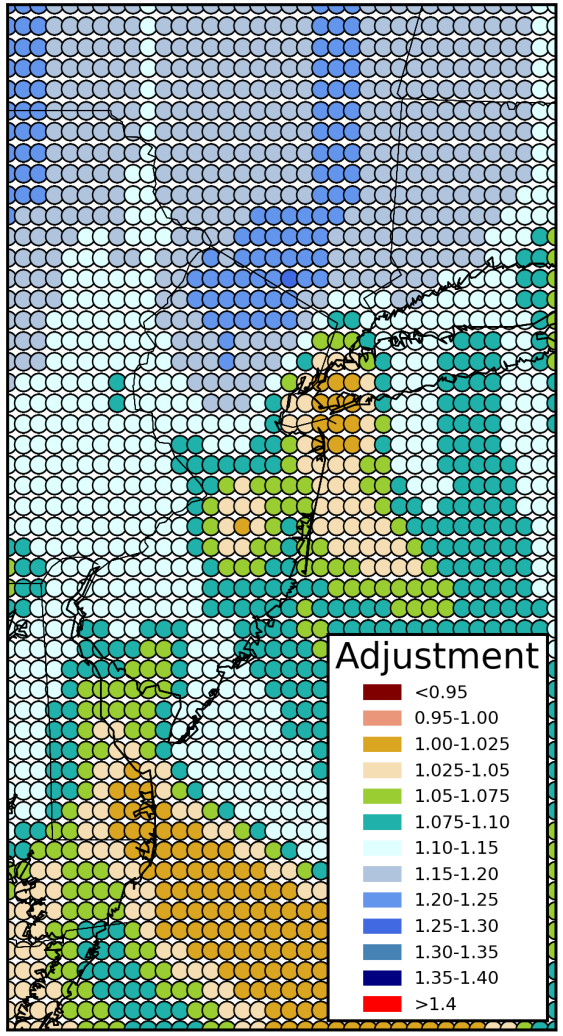
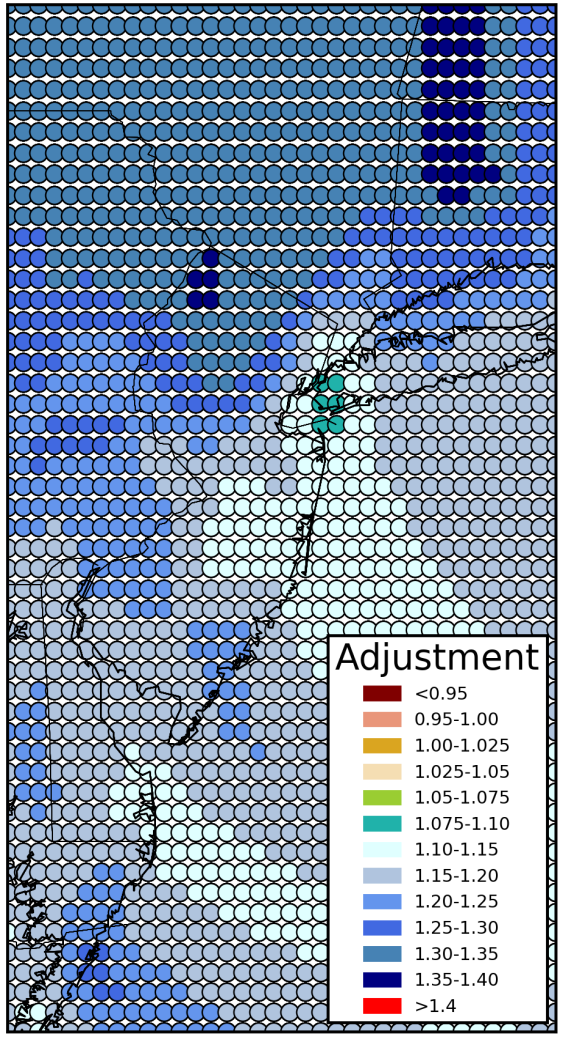
Scenarios Give a Very Different Picture of the Future

100-yr RCP 4.5. 2050-2099



100-yr RCP 8.5. 2050-2099



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Not my decision category!

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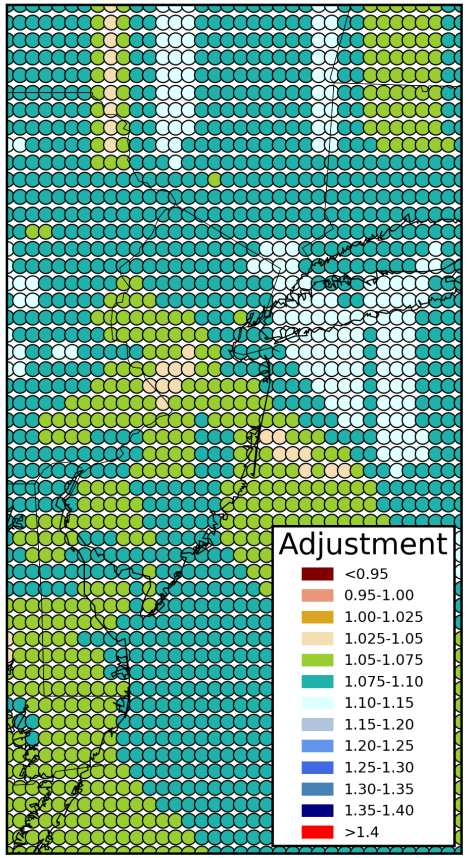
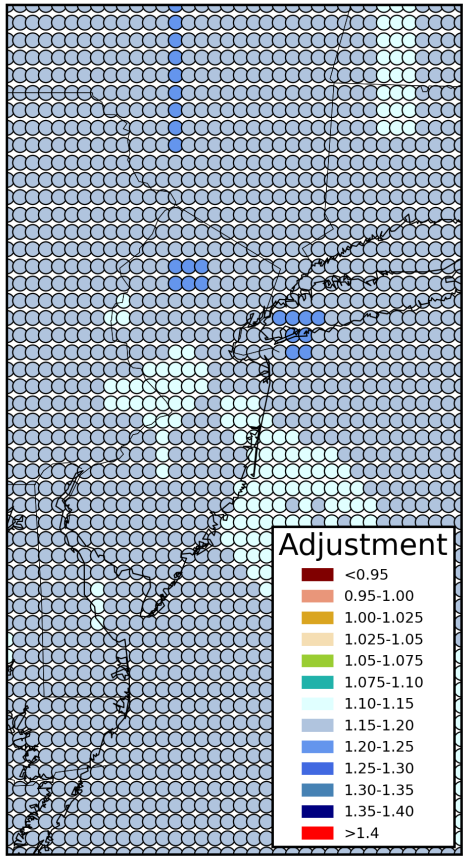
Ensemble Change Factor 17th-83rd percentile range

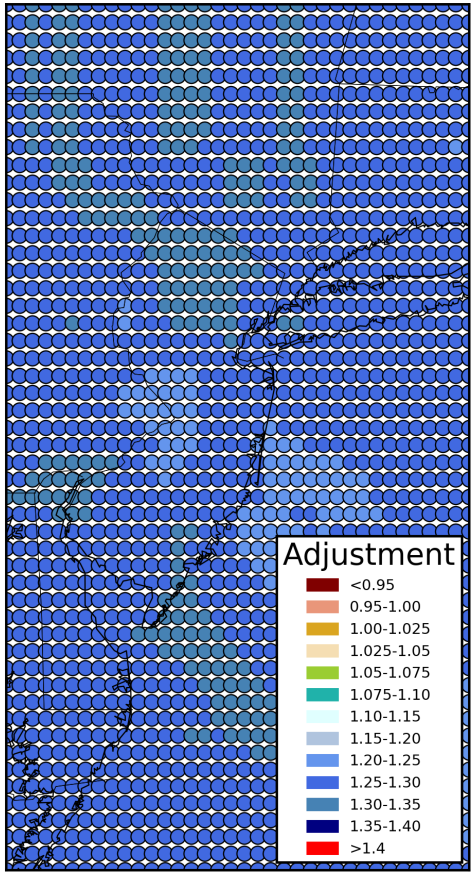
2-year ARI



17th



median



83rd

All show an INCREASE, but…..there is a large spread in the ensemble!

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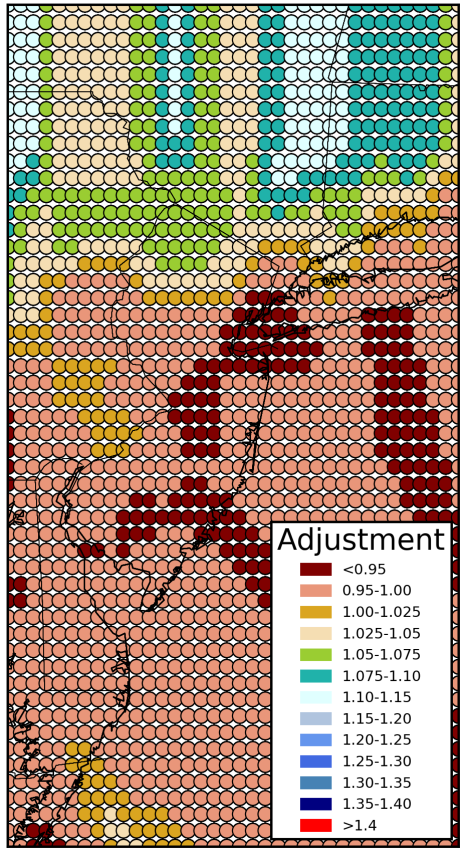
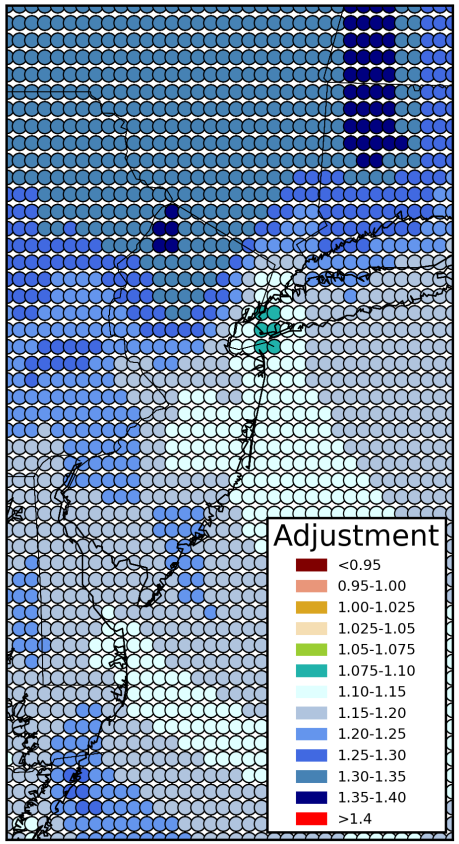
Ensemble Change Factor 17th-83rd percentile range

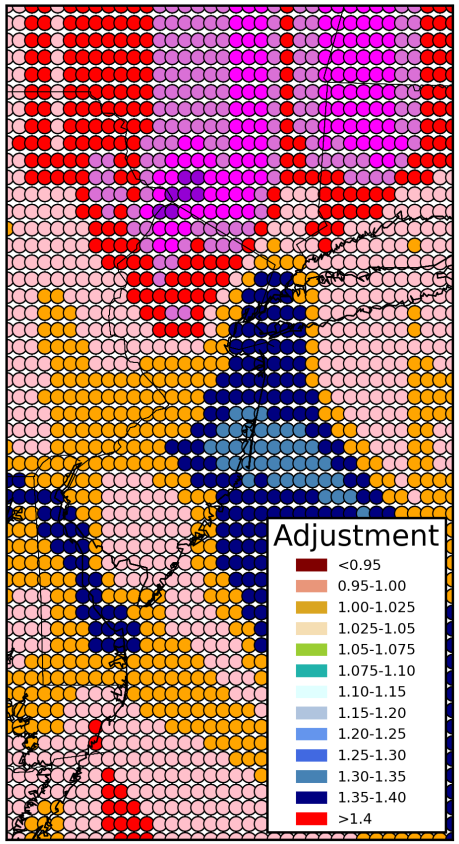
100-year ARI



17th



median



83rd

Orange 1.40-1.45
Pink 1.45-1.5
Red 1.5-1.55

NOT ALL show an increase, and the spread is even larger!!

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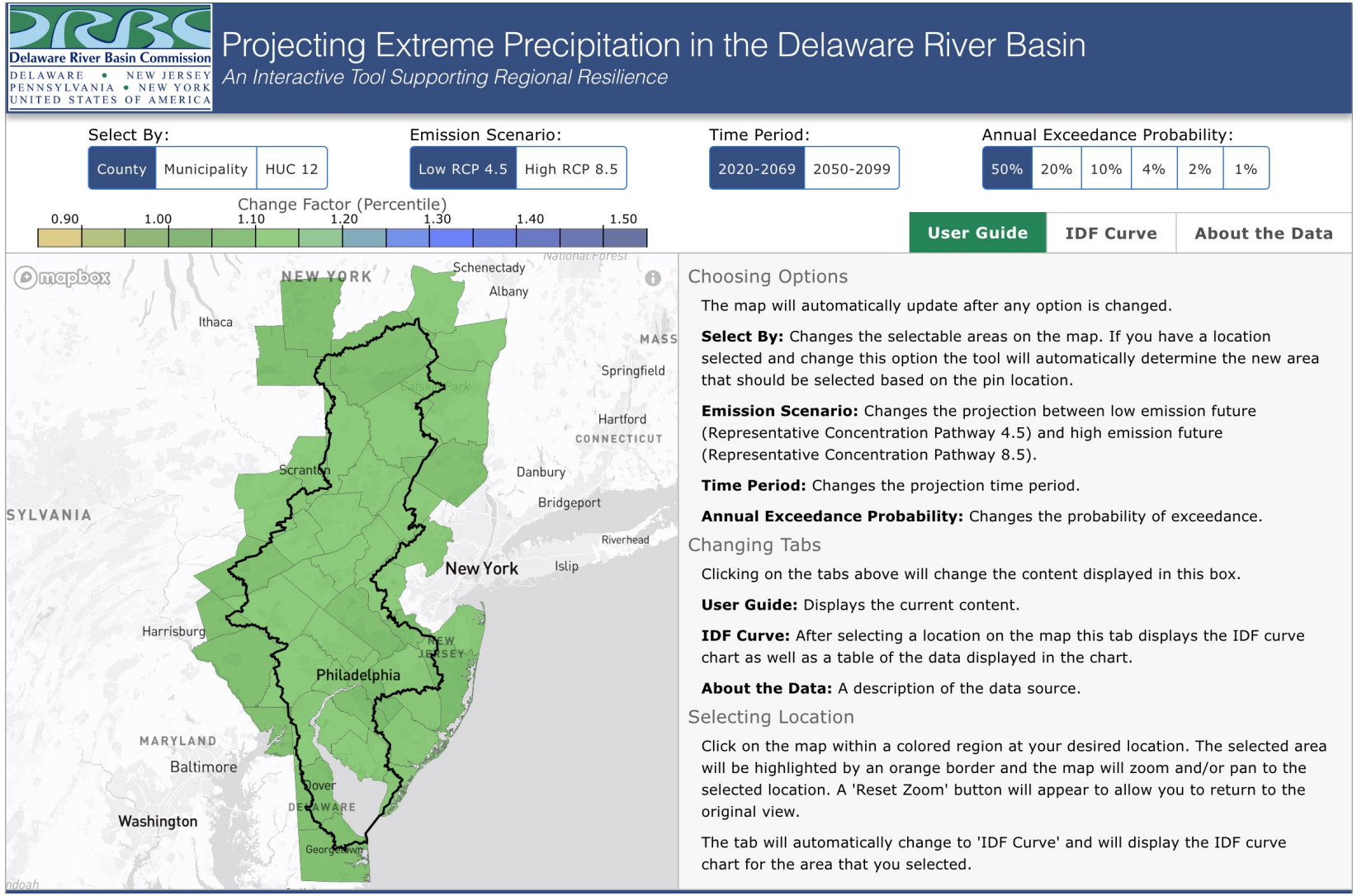

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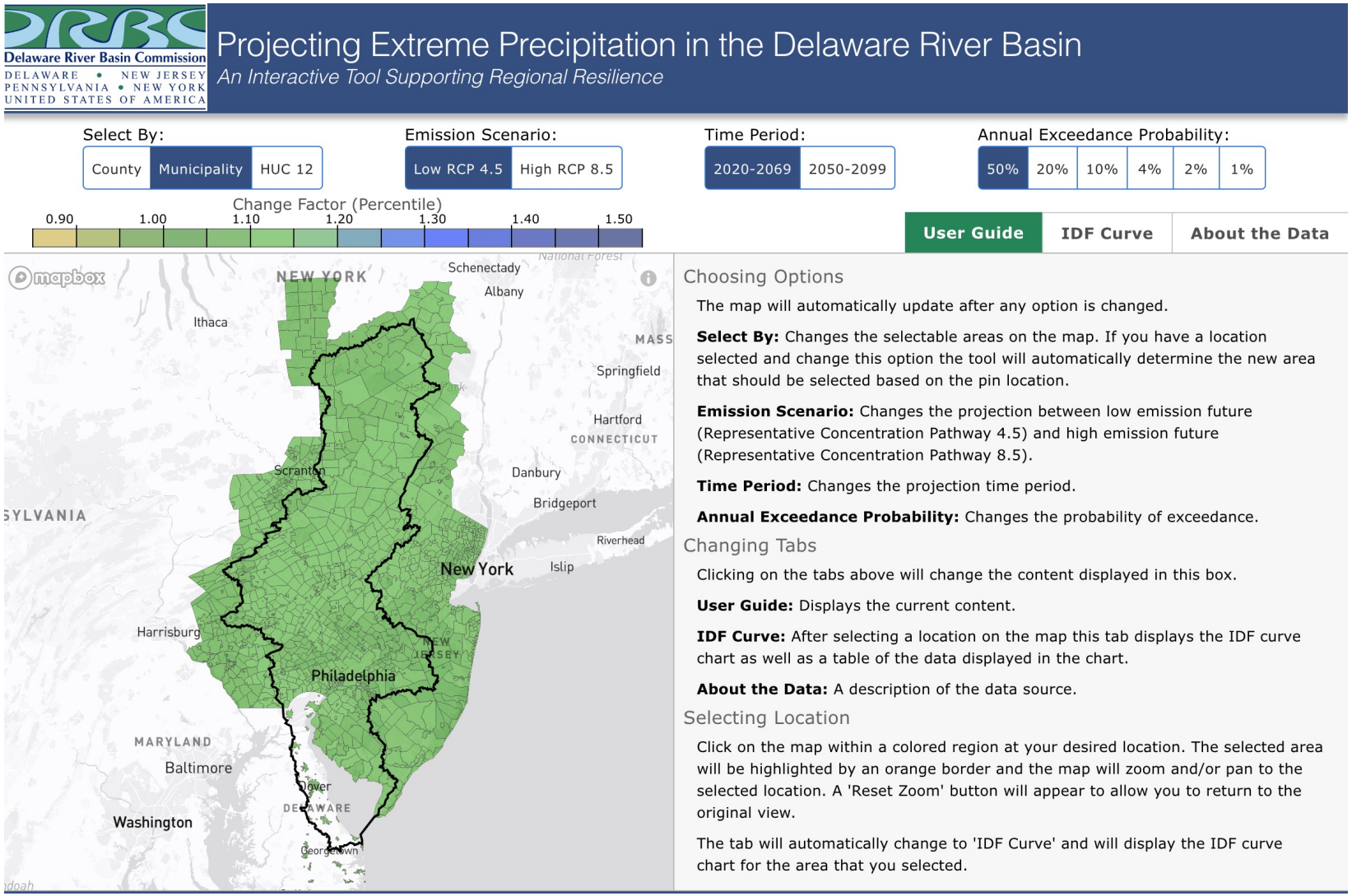

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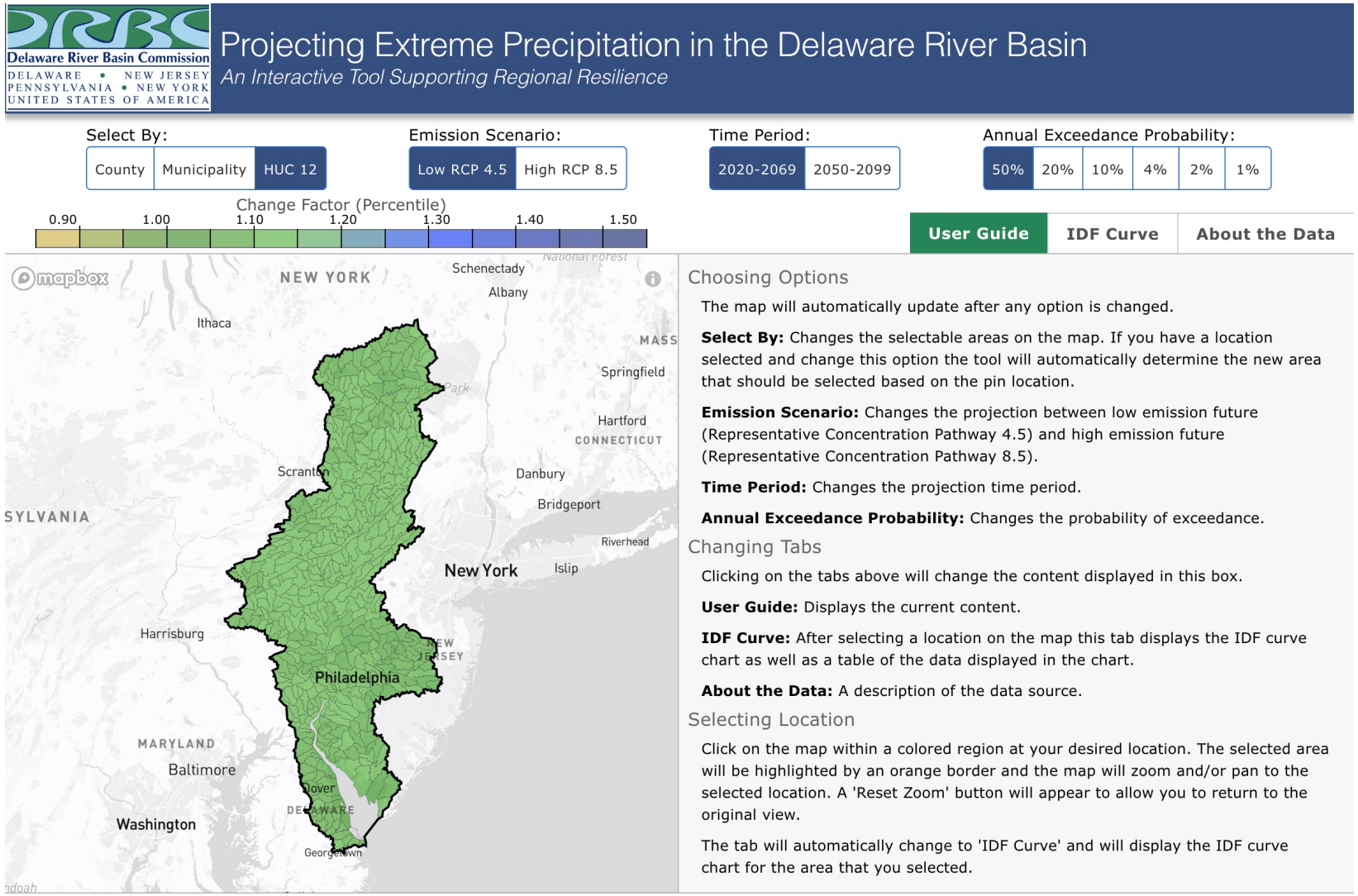

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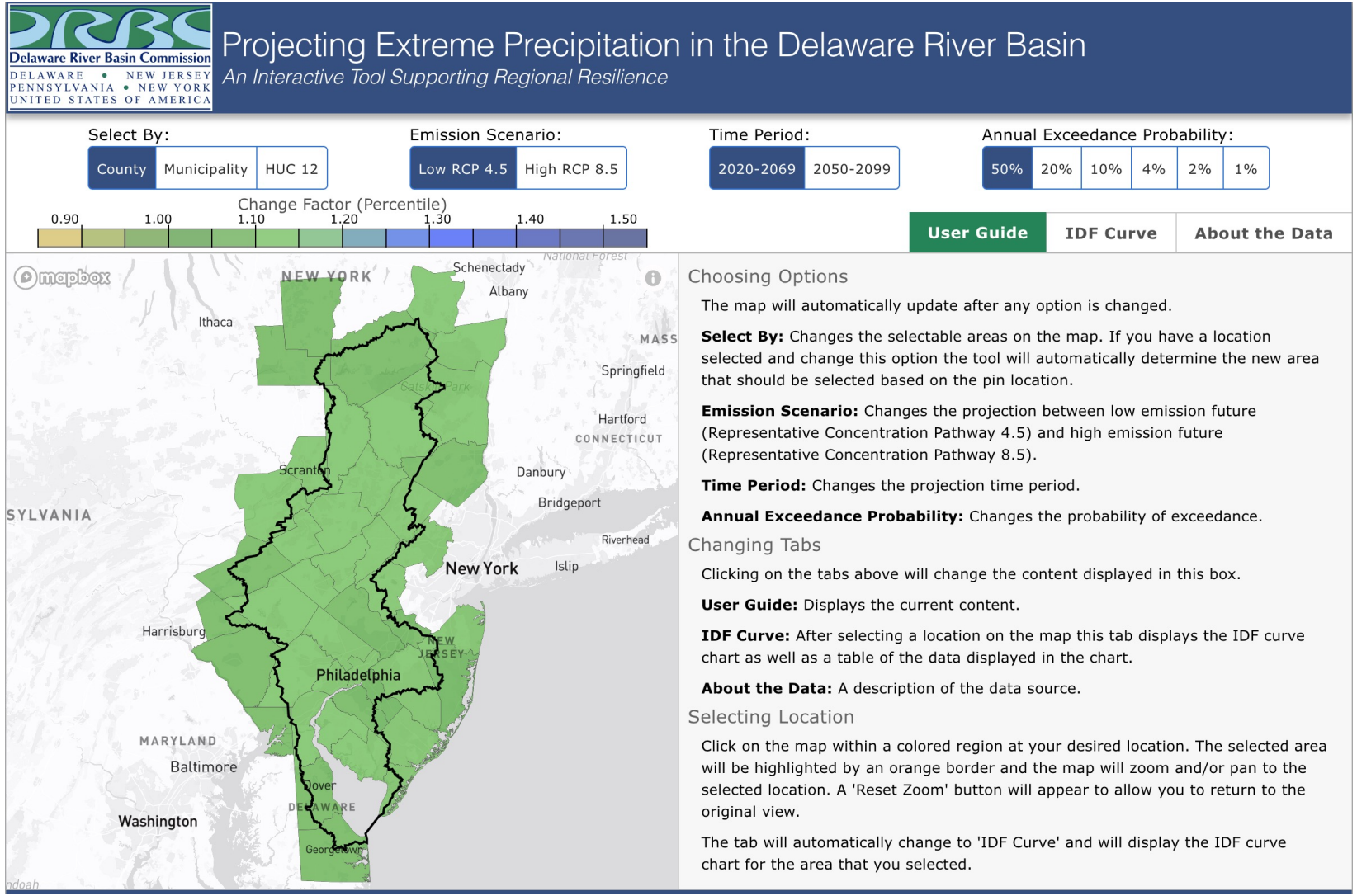

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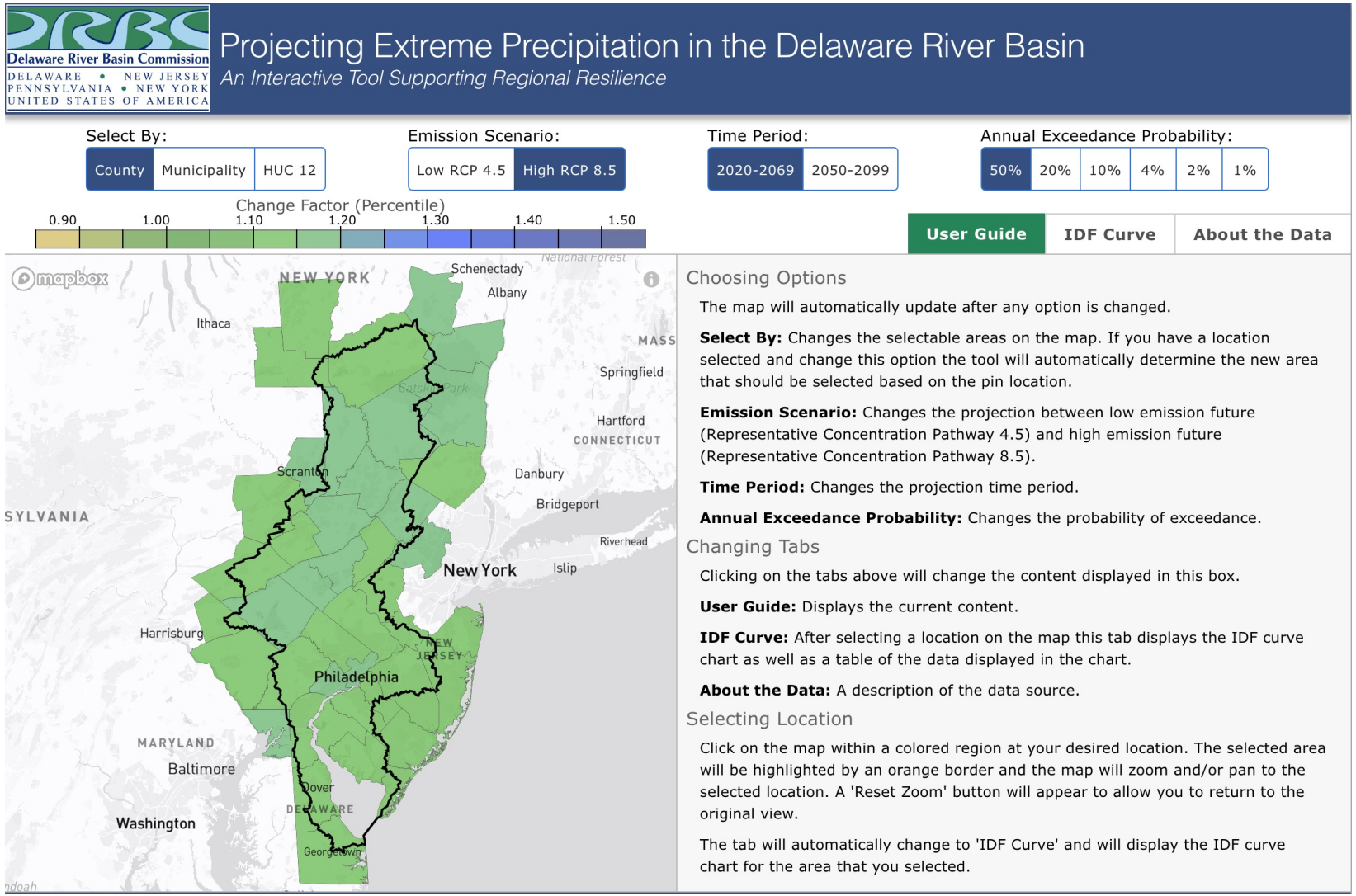

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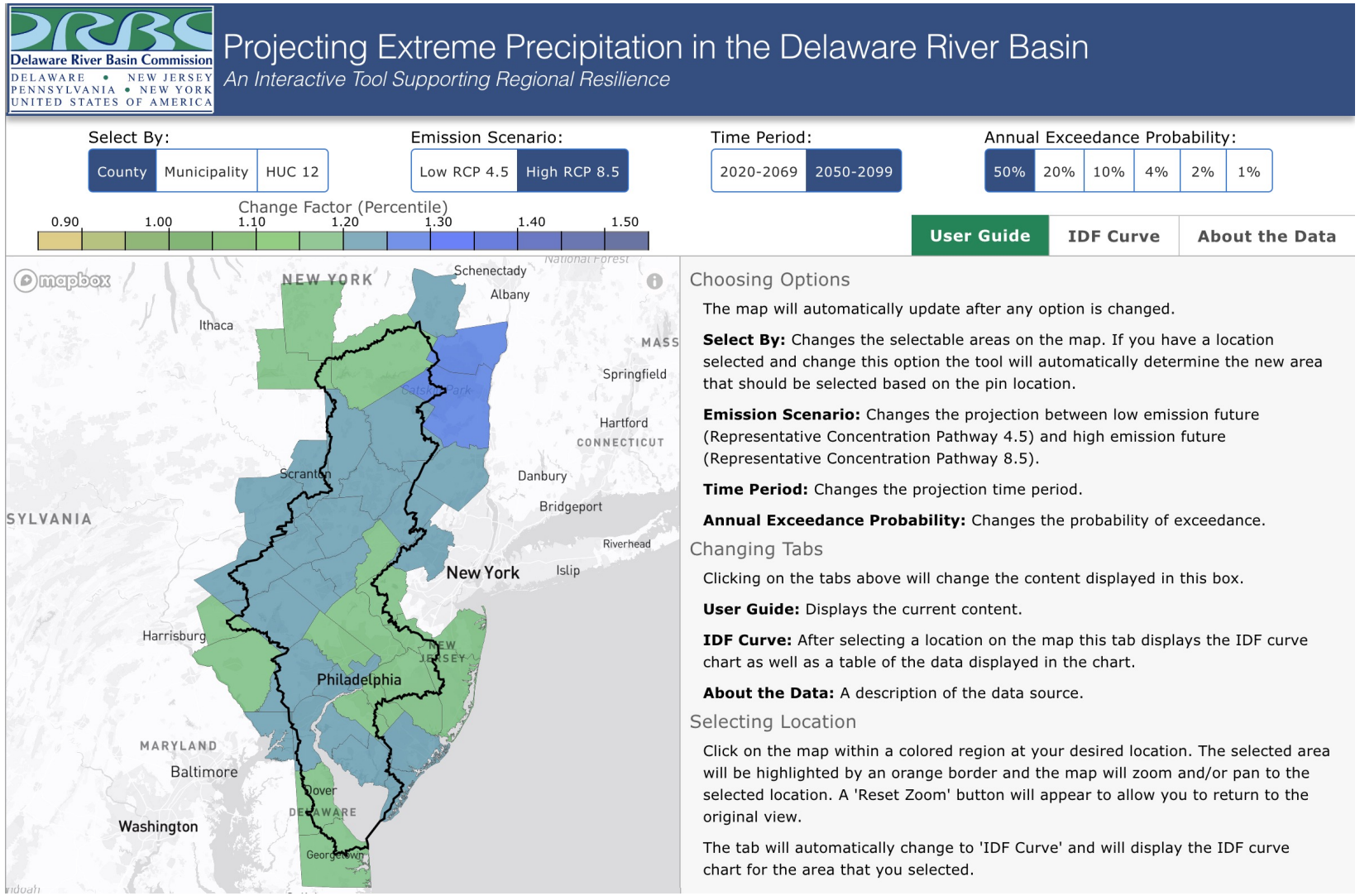

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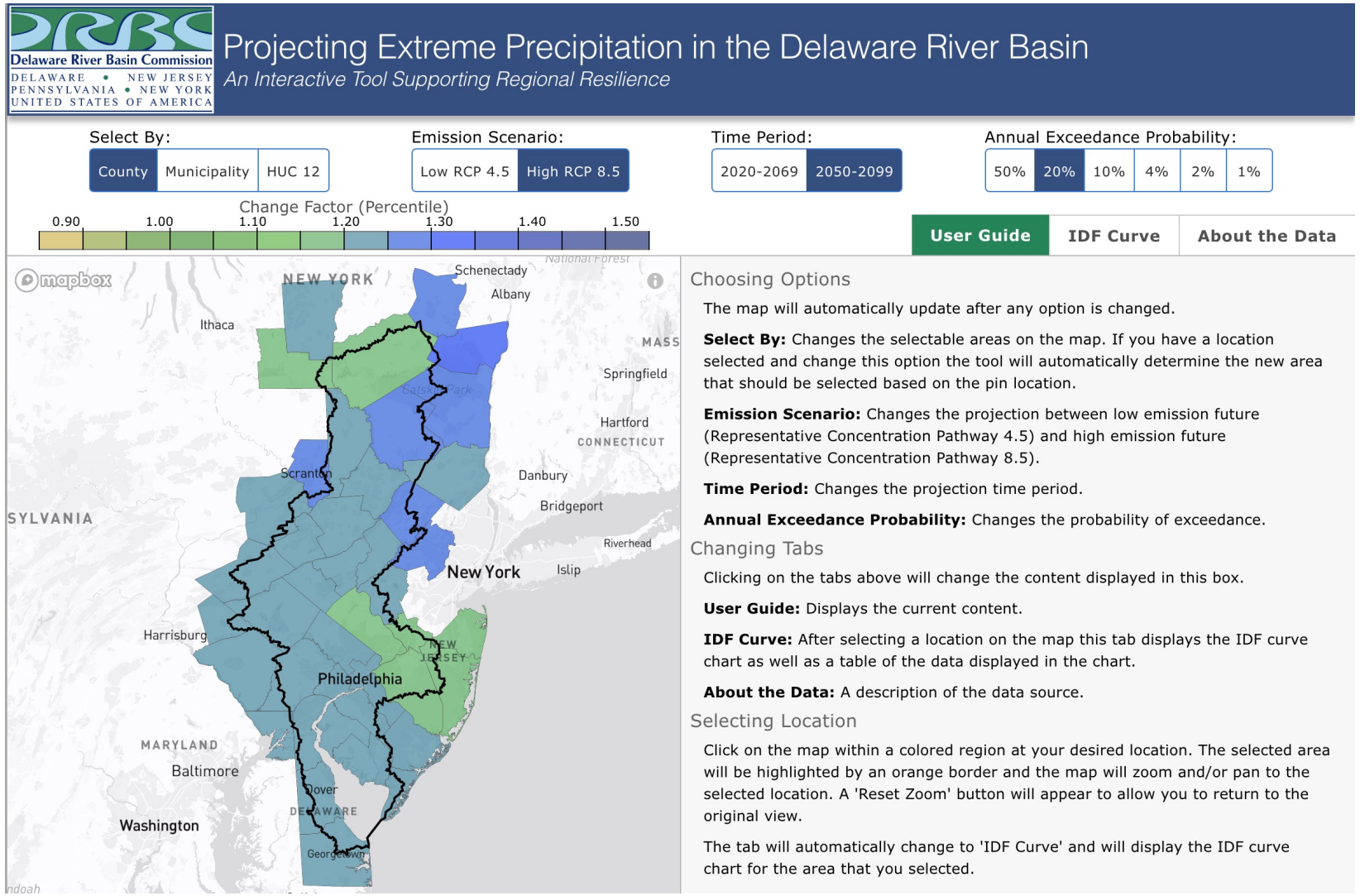

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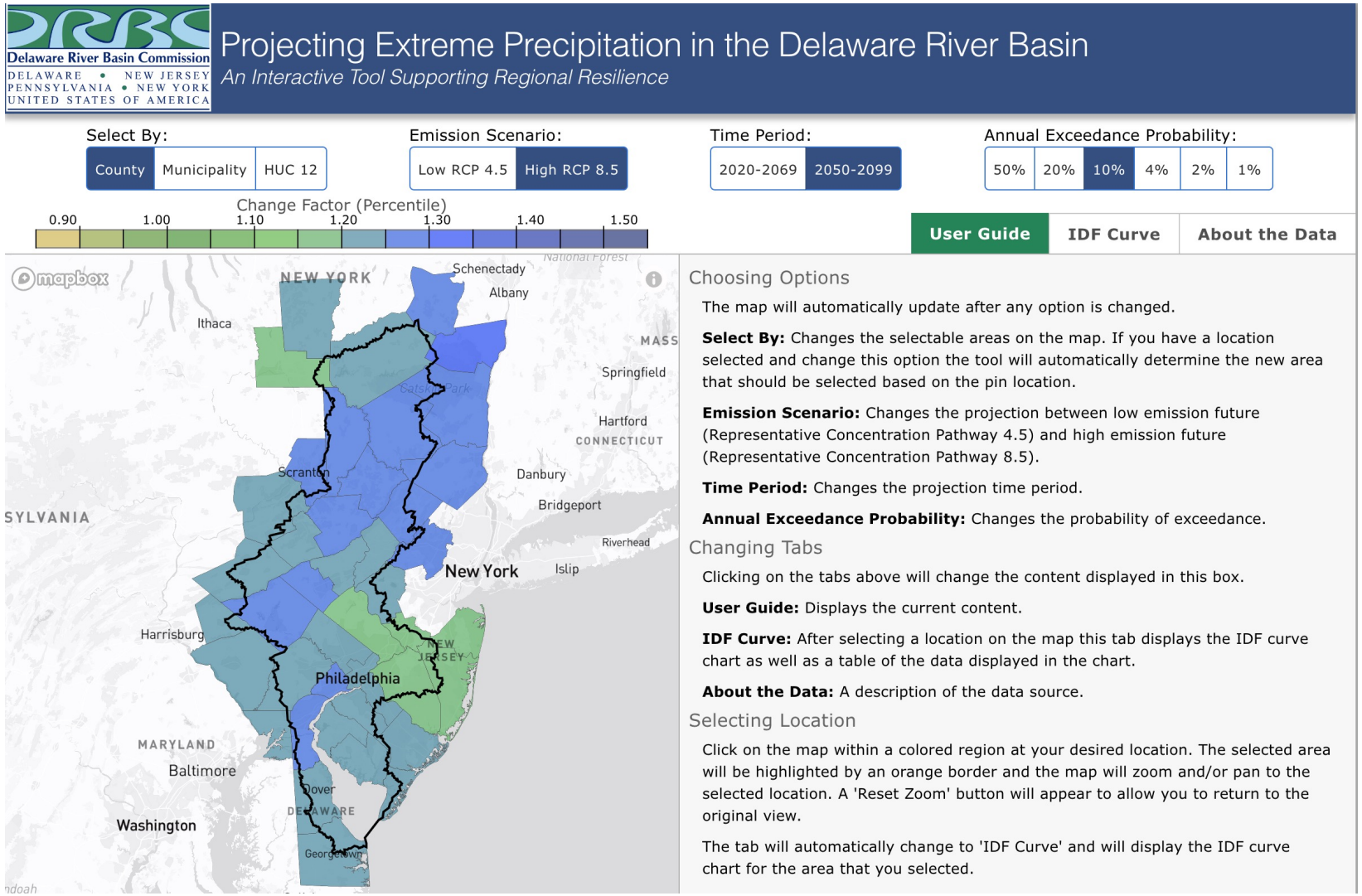

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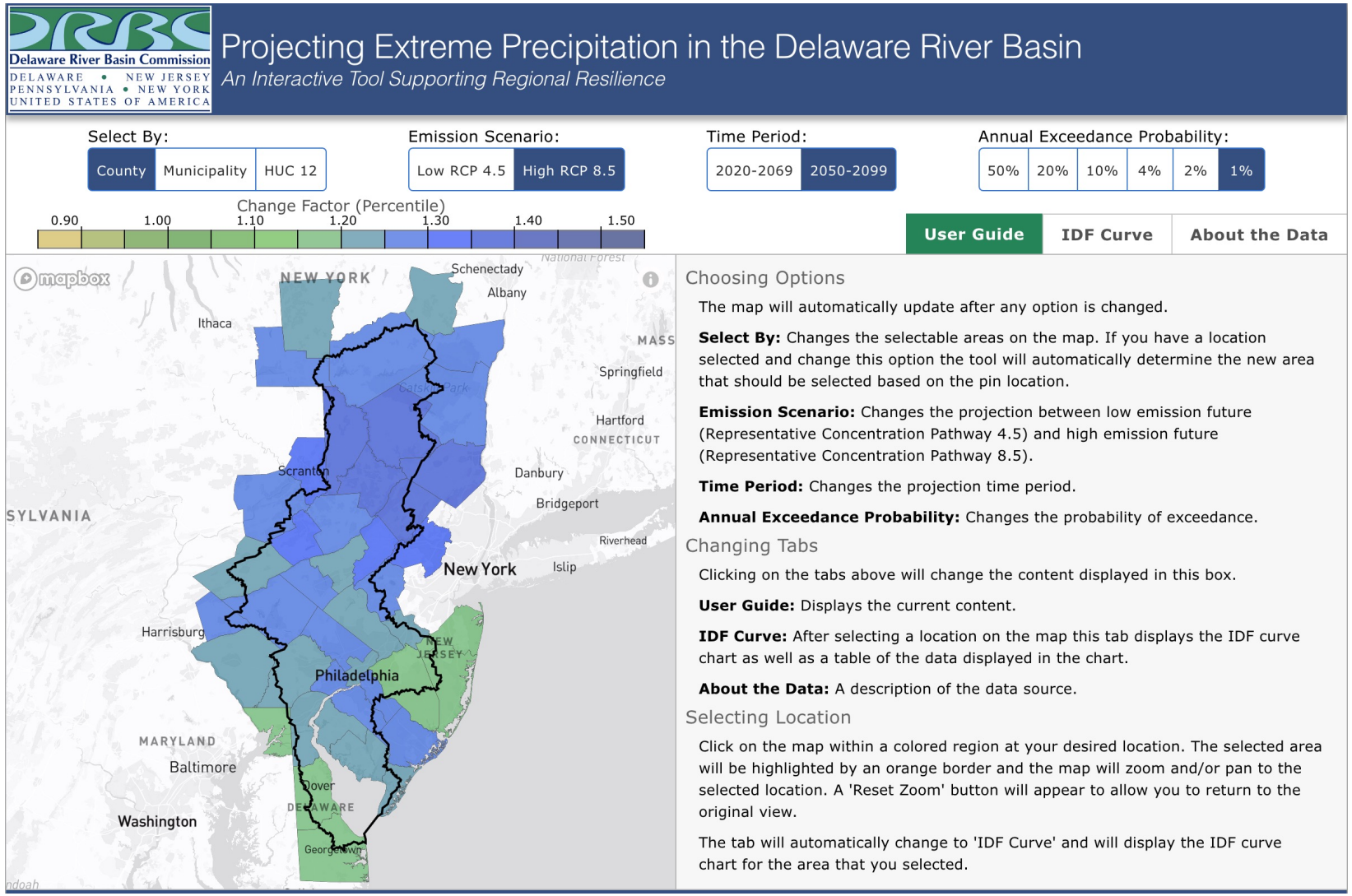

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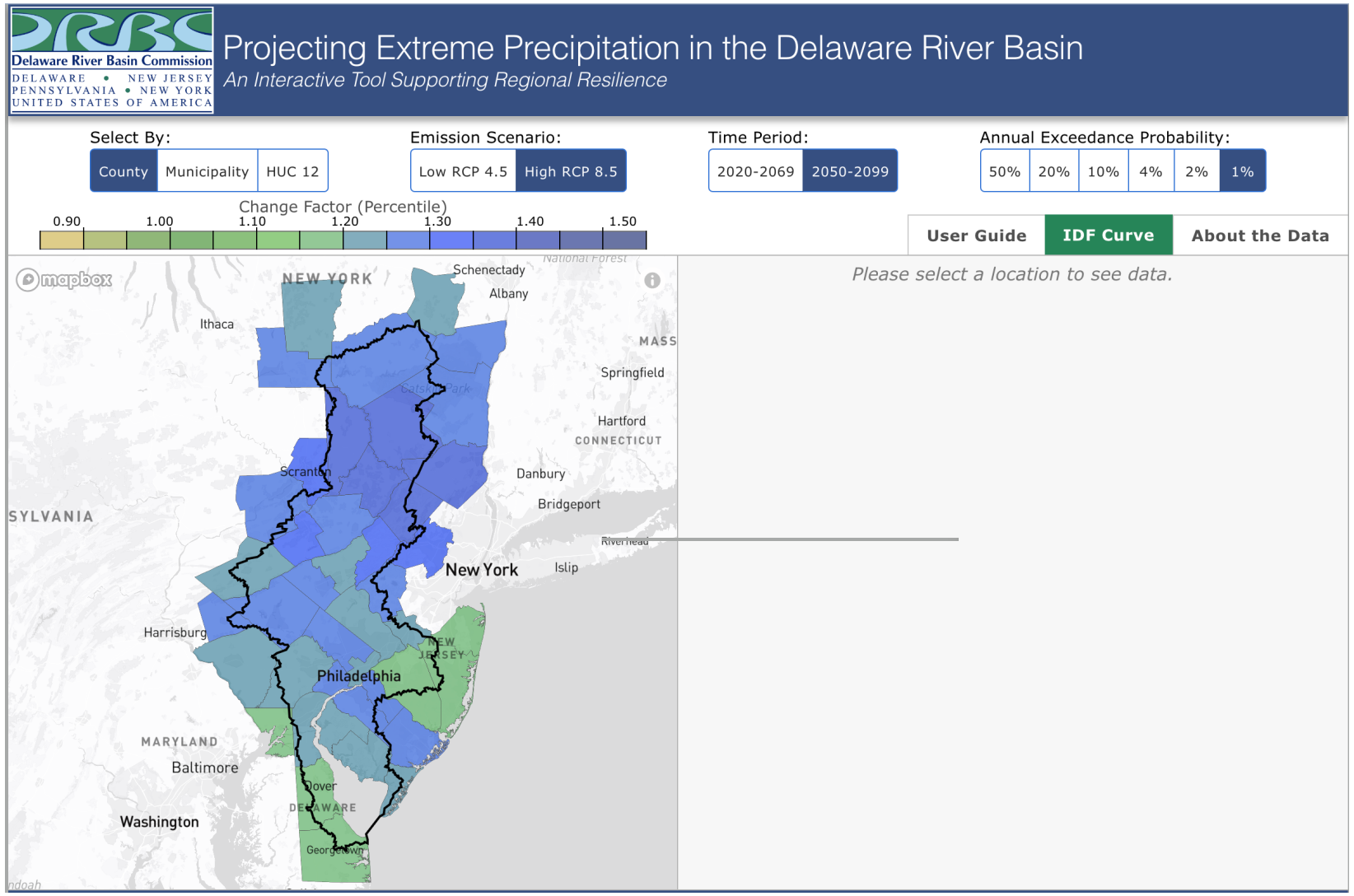

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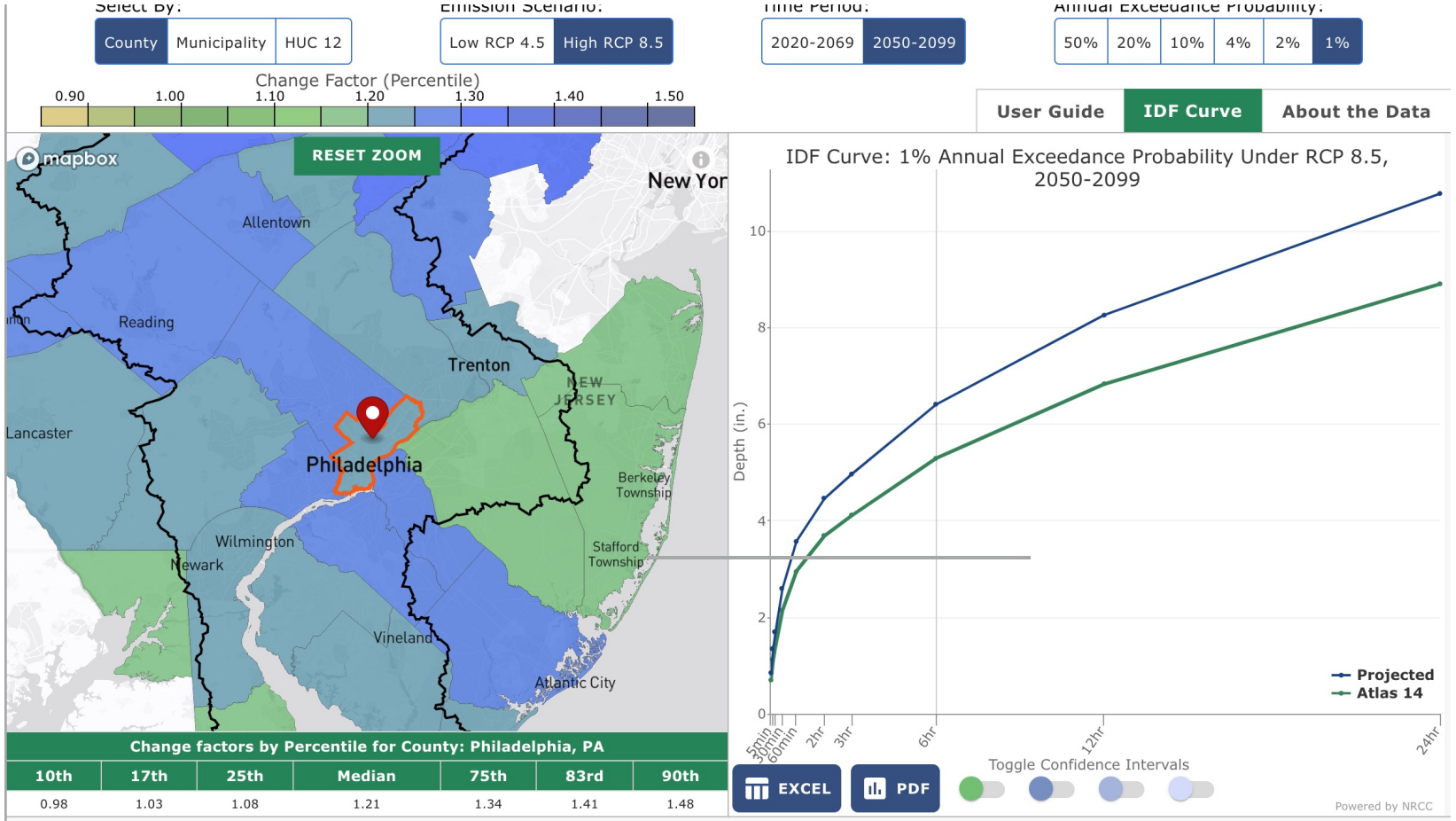

	Projected Precipitation (inch)	Atlas 14 Precipitation (inch)
Duration	**Median**	**Median**
Last Hovered (6hr)	6.40	5.29
60min	3.57	2.95
6hr	6.40	5.29
12hr	8.25	6.82
24hr	10.76	8.89

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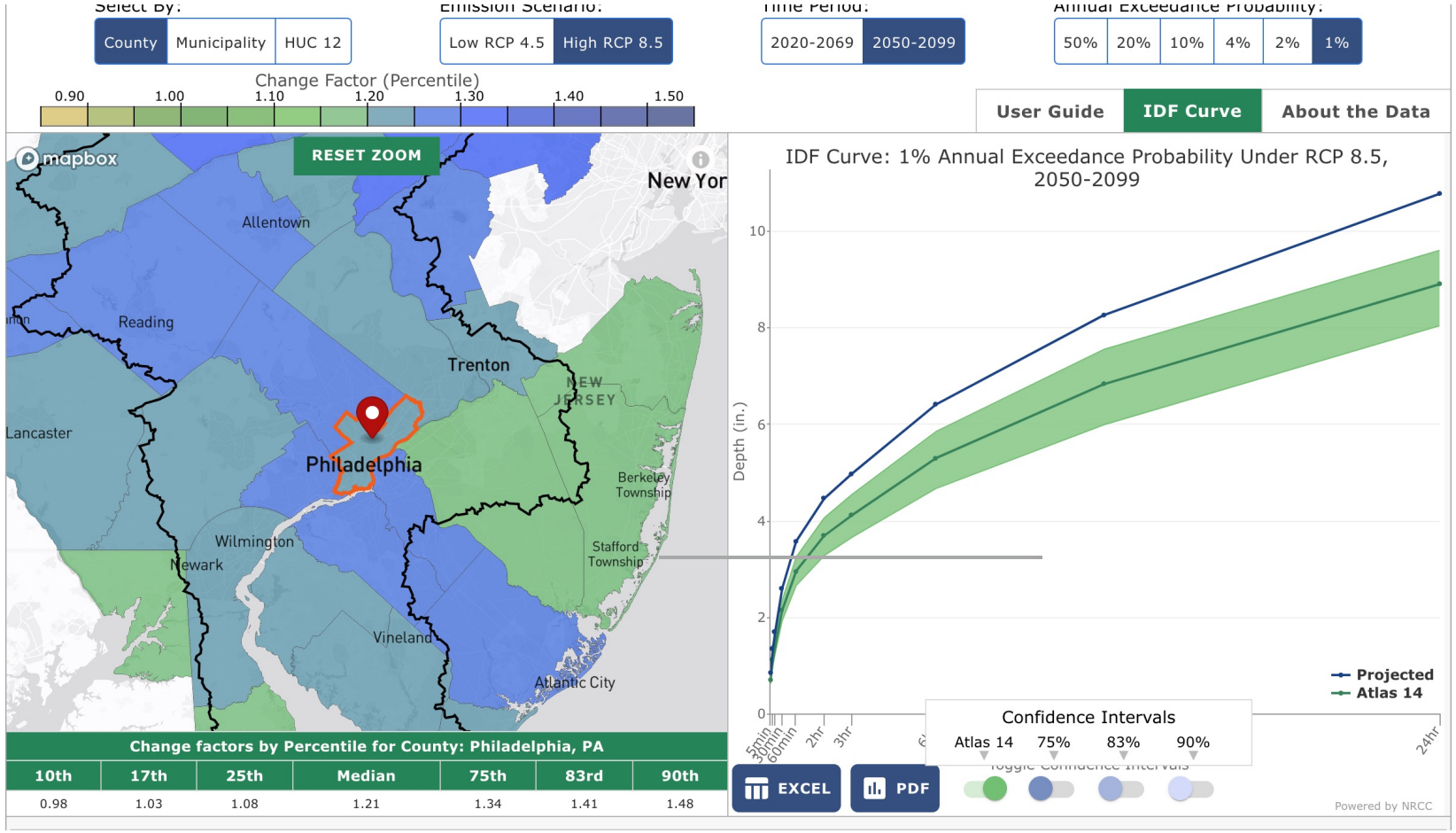

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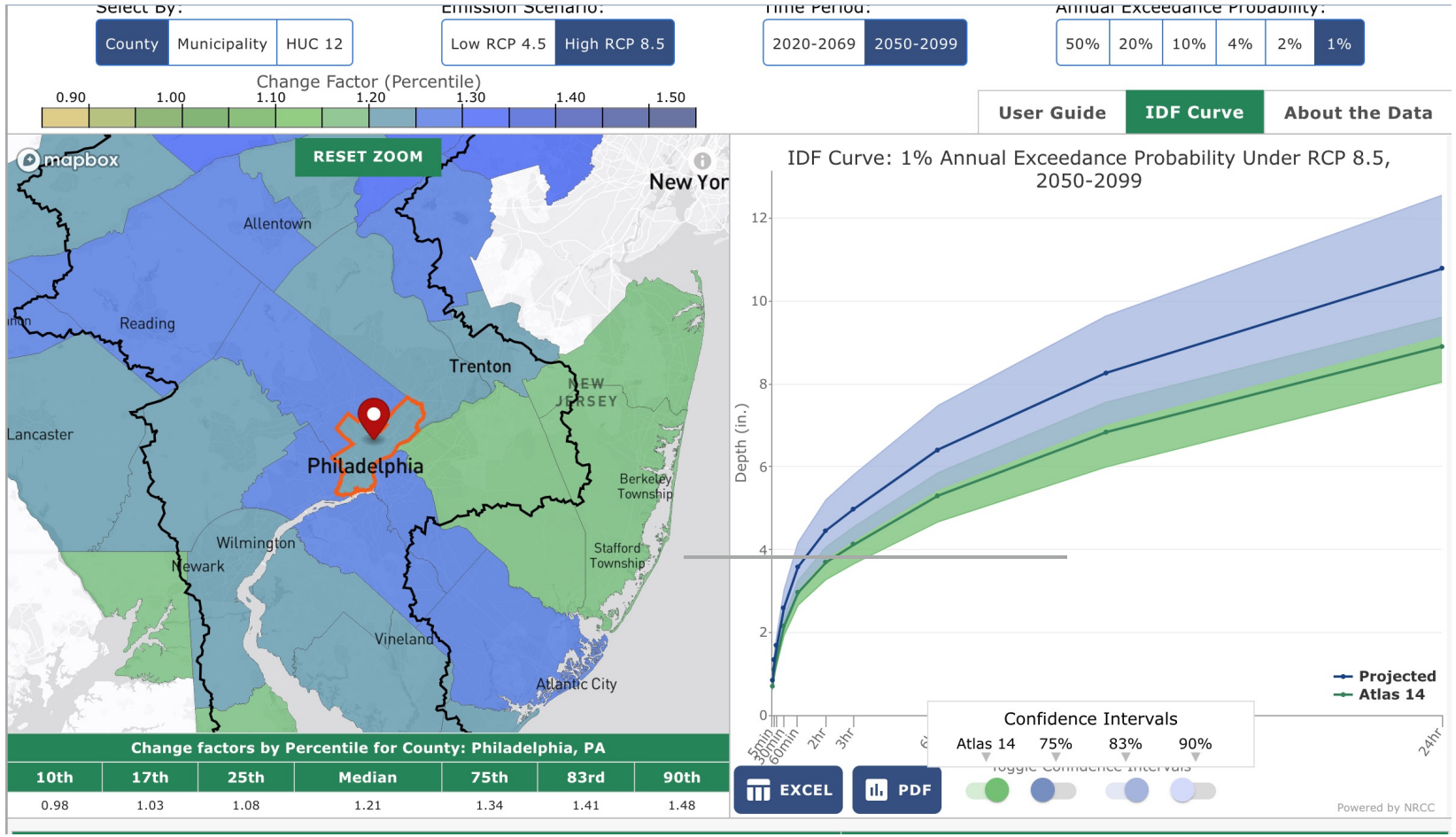

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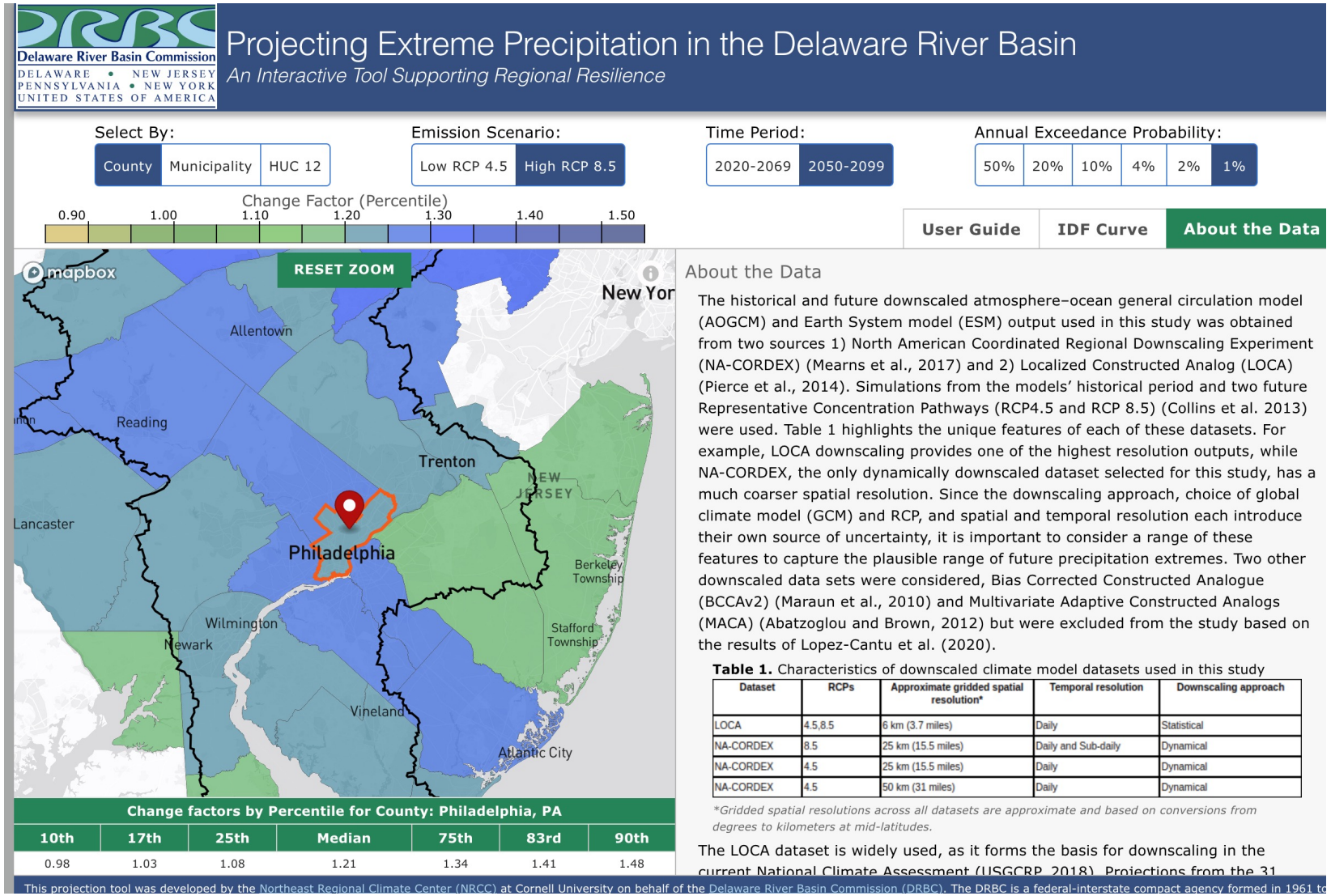

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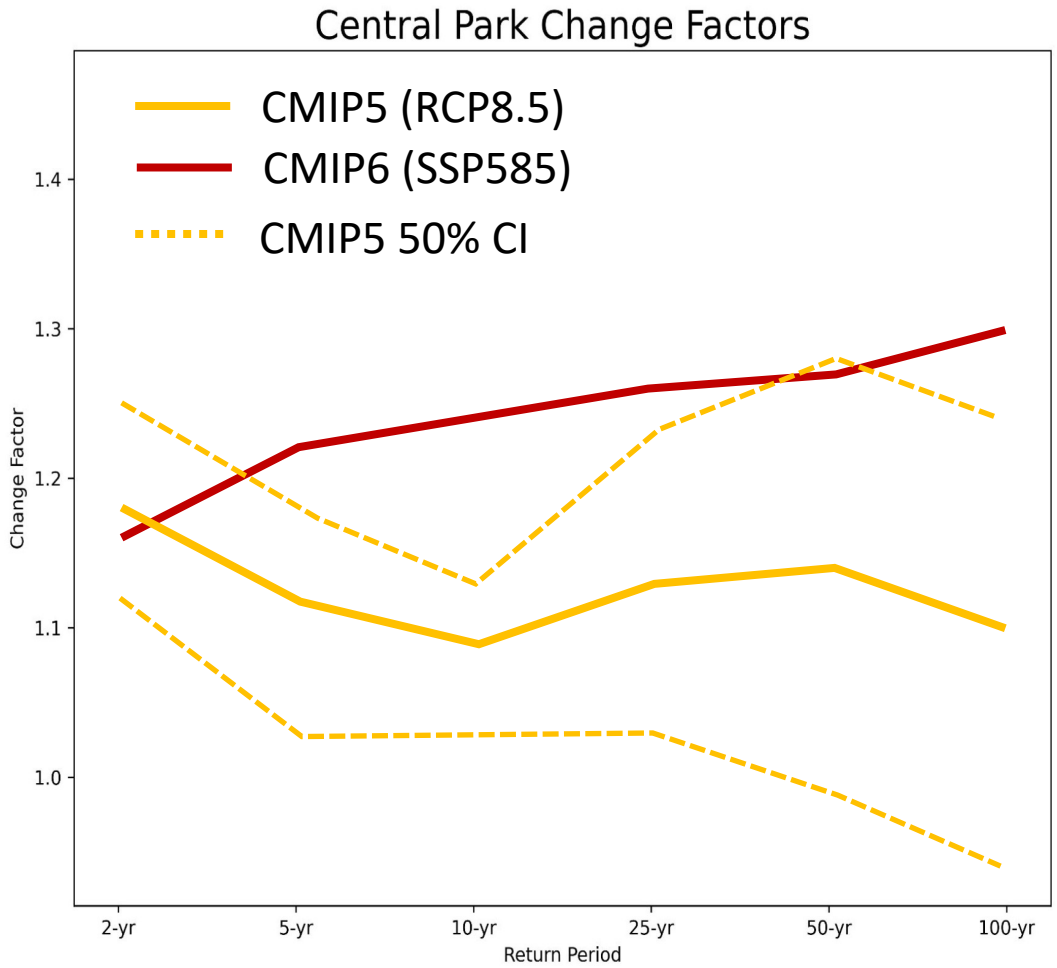
Results Need to be Updatable



Take Home Message: CMIP6 Extremes tend to be **LARGER** than CMIP5, especially at high return periods. Significance is Marginal

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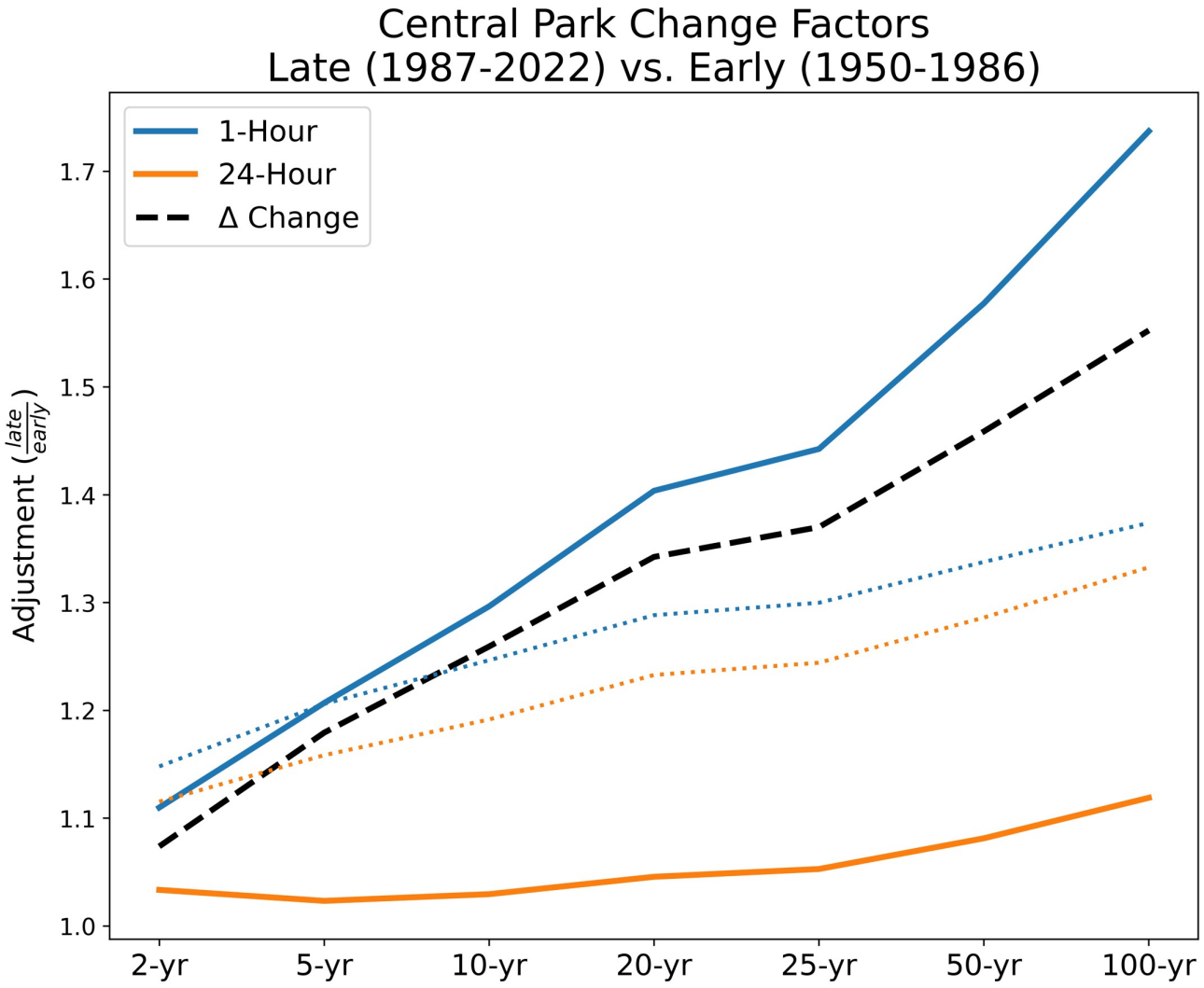
Results Should Evolve to Address Weaknesses and New Needs



Take Home Message: Since 1950 the change in extreme hourly rainfall has exceeded the rate of change of extreme daily rainfall. This is counter the assumption used in IDF development

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