Chesapeake Bay Program Partnership's Climate Change Assessment Framework and Programmatic Integration and Response Efforts

Request for STAC Peer Review
06.30.17

The Chesapeake Bay Program (CBP) partnership is undertaking a midpoint assessment of progress to ensure that the seven Chesapeake Bay watershed jurisdictions are on track to meet the 2025 Chesapeake Bay Total Maximum Daily Load (TMDL) goal. A key element of this effort is the incorporation of the latest climate science, data, tools, and BMPs into the partnership's decision support tools to help guide implementation and to use this new information to facilitate and optimize implementation of the jurisdictions' Watershed Implementation Plans (WIPs).

The CBP's Scientific and Technical Advisory Committee (STAC) has conducted several assessments of climate science and recommended processes to integrate the consideration of climate change into the Bay Program's management framework (DiPasquale, 2014; Johnson et al 2016; Pyke et al 2008; Pyke et al 2012; STAC, 2011; Wainger, 2016). These reviews and recommendations assessed the latest climate science and impacts to the Chesapeake Bay watershed and highlighted the need to more effectively embed climate change among partnership goals in decision making, identify and prioritize vulnerabilities of restoration efforts and management actions, and utilize partners' ongoing research efforts to better assess and evaluate responses to changing climatic conditions.

Along with culminations of past STAC assessments as well as stand-alone peer reviews of the general approach to incorporate projected 2025 and 2050 climate change variables into the Watershed Model (WM) and estuarine Water Quality and Sediment Transport Model (WQSTM) modeling processes (currently underway), the Modeling and Climate Resiliency Workgroups request a more thorough evaluation of the Partnership's climate change assessment framework and plans for incorporating climate change into programmatic efforts.

Questions for STAC Peer Review:

Question 1) Please comment on the overall approach to incorporate projected 2025 and 2050 climate change into the Watershed Model and Water Quality and Sediment Transport Model.

Question 2) How well do the global circulation models used for producing 2025 and 2050 climate scenarios show skill in hindcasting the actual climate and hydrological changes that have happened in the Chesapeake Bay watershed over the past decades?

Question 3) Please comment on the appropriateness of the methodology to account for uncertainty in 2025 and 2050 climate projections.

Question 4) Please comment on the CBP's use of multiple Representative Concentration Pathways (RCP's) and their associated 10^{th}, 90^{th} percentiles and the median projections to derive 2025 and 2050 temperature estimates and 2050 precipitation estimates?

Question 5) Please comment on the CBP's selection of the downscaling approach, Bias Corrected Spatial Disaggregation (BCSD) downscaling methodology to derive 2025 and 2050 temperature estimates and 2050 precipitation estimates?

Question 6) Is the interpretation of downscaled climate data from a gridded product (⅛° resolution) to a county-scale within the Watershed Model sufficient to represent changing climatic patterns and assess load responses at a larger regional scale?

Question 7) Given limitations of modeling resources, policy and governance, is the applied Delta Approach for precipitation, temperature and evapotranspiration adequate to represent a range of potential changes in climatic forcing variables? Are there limitations in the ability to capture potential variability of precipitation intensity, temperature swings, or timing of extreme events (e.g., storm occurring early in growing season vs. late fall) that would affect the ability to assess the impact of less probable but higher magnitude events (e.g., Hurricane Isabel)?

Question 8) Is the use the Karl and Knight (1998) estimates of precipitation intensity appropriate for modifying 2025 precipitation intensity? Is it sufficient to apply these estimates to the entire watershed based on their central Mid-Atlantic derived trends?

Question 9) The models (both the old P5 and new P6 versions) use a 10-year average hydrology for the simulation. The 10-year period that is used is 1991-2000. The TMDL and planning targets are also based on a hydrologic critical period (1993-1995) for meeting WQ standards. With the latest information we have about climate science and given the methods that being used to incorporate changing temperature, precipitation, and sea-level into the models, are these periods still appropriate, when the hydrologic averaging period is 17 years old and the critical period is 23 years old?

Question 10) Was the use of a modified Hargreaves-Samani evapotranspiration methodology sufficient to capture expected changes due to projected temperatures? In addition, should other ET methodologies be considered to develop a comparison of ET estimates?

Question 11) Please comment on the appropriateness of the methodology to select 2025 and 2050 sea level rise scenarios for application in the WQSTM?

Question 12) Given limitations on available data sets and modeling products, as well as uncertainty about how wetlands within differing geographies may adapt to changes in sea level over-time, please comment on the appropriateness of the methodology to project 2025 and 2050 tidal wetland change?

Question 13) Does the applied methodology reflect the latest and best scientific understanding of the influence of climate on watershed processes and estuarine responses; is there any additional scientific information that should be included?

Question 14) Many of the plans to incorporate climate change into programmatic efforts are using more qualitative information. To what extent is there reliable quantitative information on which land uses and BMPs are going to be impacted by climate change? Is there quantitative

information on modification that can be made to land use and BMPs that are effective in addressing climate change?

Question 15) For longer term CBP considerations, how can the overall approach and procedures be improved and what alternative approaches and data would be recommended?

Question 16) Please comment on the climate change modeling documentation. Is it clear, well organized, concise and complete?