

Maryland Commission on Climate Change
Scientific and Technical Working Group Contributions to Annual Report
September 5, 2018 *Early Draft*

The Science and Technical Work Group (STWG) of the Maryland Commission on Climate Change convened 2 forums with regional content experts on: a) updating the estimates of relative sea level rise in Maryland; and b) the impact of climate change on Maryland’s agriculture. Both of the fora are summarized below while stand-alone reports are being completed and will be released in the coming months. In addition, the STWG began its review of the uncertainties associated with the sources and sinks of greenhouse gases that are being used by MDE to assess its progress in meeting the Greenhouse Gas Reduction Act goals which will continue into 2019.

1. Updated Projections for Sea Level Rise

Due to Maryland’s 3,100 miles of tidal shoreline along the Chesapeake Bay, Atlantic Ocean and the Coastal Bays, it is one of the most vulnerable States to sea level rise. Therefore, the Maryland Commission on Climate Change has give particular attention to sea-level rise as a significant threat. Prior to the 20th century, this was largely due to the slow sinking of the land since Earth’s crust is still adjusting to the melting of large masses of ice following the last glacial period. Over the 20th century, however, the rate of rise of the average level of tidal waters with respect to land, or relative sea-level rise, has increased, at least partially as a result of global warming.

A group of independent scientists held a forum and developed special report of the STWG entitled *Updating Maryland’s Sea-level Rise Projections* (2013). In 2013, the experts’ best estimate for the amount of sea-level rise in 2050 is 1.4 feet and would be unlikely to be less than 0.9 feet or greater than 2.1 feet. Their best estimate for sea level rise by 2100 is 3.7 feet and would be unlikely to be less than 2.1 feet or more than 5.7 feet based on current scientific understanding.

A similar group was brought together in October of 2018 to reassess the 2013 projections based on new scientific understanding of the global, regional, and local impacts of global climate change; updated tools to make future projections; and best professional judgment. Developing projections for relative sea-level rise along Maryland’s coasts requires consideration of the many factors that will affect: (1) the rise in global mean sea level (GMSL); (2) regional differences in sea level with regard to the global mean; (3) vertical land movement (VLM); and (4) changes in tidal range and storm surges due to inundation.

MD Relative Sea Level Rise	2013 Projections	2018 Projections
Best Estimate	1.4 feet	<i>TBD</i>
Low Estimate	0.9 feet	<i>TBD</i>

High Estimate	2.1 feet	TBD
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Implications to Maryland of the 2018 sea level rise estimates include:

1. TBD
2. TBD
3. TBD

2. *Impact of Climate Change on Maryland's Agriculture*

The STWG hosted a one-day forum in October with scientists and organizations that focuses on the current status of research on the impacts of climate change on agriculture in Maryland, its implications, and potential solutions. In 2011, the STWG completed a similar report. The key finding identified then included:

- *Warmer temperatures and more variable precipitation will likely lead to changes in crop and animal production and pest management.* Maryland farmers will likely have to plant different crop species and more drought-tolerant varieties of the ones they currently plant. Farmers will likely face increased costs associated with the summer cooling of poultry and livestock and the need for a rapid response to variable precipitation and pest infestation.
- *More intense water management and increased technical and financial support for agricultural transitions will help boost resilience.* Changing climate is very likely to cause changes for farmers. They may need to shift the timing of planting or fertilization, or increase irrigation and the cooling of animal production facilities. As farmers adjust, state and local governments will need to provide new education and training and to help alleviate the costs and risks associated with these changes.
- *Farmers need new information tools to support decisions regarding environmental and economic conditions.* Increased investment in improved monitoring and forecasting tools would increase a farmer's ability to prevent, rather than react to, adverse impacts.

Since 2011, there have been significant new research programs focused on the global, regional and state impacts of climate change on Maryland agriculture. Therefore, the STWG felt it best to bring together researchers to initially discuss their current studies and key findings. Topics to be covered include: existing research on carbon sequestration; salt water intrusion and planning; agricultural best management practices in the context of a changing climate, developing Watershed Implementation Plans (WIP), and meeting the Total Maximum Daily Load; survey of crops under different climate change scenarios; and agricultural biomass, bioenergy, and manure treatment technologies. Following these presentations, a facilitated discussion will be focused on: a) key findings of current research; b) vulnerability to agriculture; c) potential solutions; and d) future research needs. The final report is expected to be released in early 2019.

Impacts to Maryland's agriculture and possible solutions potentially include:

1. TBD
2. TBD

3. TBD
4. TBD
5. TBD

3. *Estimates and Uncertainties Associated with Emissions and Uptake of Greenhouse Gases*

This activity will begin in September 2018, but will be a major focus in 2019. The STWG will work closely with MDE to evaluate:

- **Emission Estimates.** MDE's inventories of greenhouse gas emissions are estimated directly from electricity and fuel indirectly estimated for transportation. These three categories make up approximately 90% of the total emission. However, there are many uncertainties in the emission estimates associated with forests, agriculture, wetlands and waterways.
- **Net Sinks of Greenhouse Gases.** Estimation of the net sinks are generalized for forest carbon flux and organic biomass storage. While wetlands, waterways, and agricultural soils can be sinks they can also be sources of emissions.
- **Land Use and Land-Cover Estimates.** Growth simulation modeling suggests that Maryland will confront significant land-use and land-cover changes by 2030 and beyond. This has quantitatively significant implications for net greenhouse gas emissions (including sequestration) from forests, agricultural lands, and wetlands, as well as for vehicle miles travelled (VMT) and, consequently, on-road vehicle emissions.