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MARYLAND COST OF INACTION

Introduction

This document summarizes the main findings of Chapter 3, "Climate Change Impacts on Maryland and the Cost of Inaction," of the report by the Maryland Governor's Commission on Climate Change entitled "Climate Action Plan." That chapter has been provided by the Center for Integrative Environmental Research and

- identifies key economic sectors in Maryland, likely affected by climate change
- provides examples of the direct economic impacts that could be experienced
- presents numeric quantifications of direct and indirect economic effects of climate change on Maryland.

While we do not suggest that any of the past weather-related impacts on the state are, unequivocally, climate change induced, observations of past impacts can help illustrate the kinds of challenges to be faced in the future, and the kinds of costs to be incurred, should the state not be adequately adapt to climate change.

The full report as well as technical details, background materials and references to the data and scientific studies on which this summary is based are found at: http://www.cier.umd.edu/climateadaptation

MD Climate Change in the Making

- Average annual temperatures for the Mid-Atlantic region have increased by .5-1° F (.3-.6° C) since 1900, which is more than the global average, while Maryland's average annual temperature has increased about 2° F (1° C).
- Average temperature of the Chesapeake Bay has warmed by 2° F over the same time period.
- Average precipitation has increased by 10 percent throughout most of Maryland and the entire Mid-Atlantic region of the US has received 12-20 percent more major weather events relative to the previous century.
- The sea level along the Maryland coastline has risen at a rate of 3-4 mm/year (.14 inch/year) over the last century – nearly twice the global average of 2 mm/year (.08 inch/year).
- Climate models suggest these trends will continue while the frequency and severity of extreme events are likely to increase as well.

Coastal Impacts

- The largest economic impact of climate change for Maryland will be on its coastal infrastructure and development.
- Maryland's 16 coastal counties and Baltimore City are home to 67 percent of the state's population in addition to hosting numerous tourist destinations, industrial sites, extensive commercial and residential development, and diverse ecosystems.
- The Baltimore-Washington corridor is the most economically valuable region in Maryland with 86 percent of the population and 90 percent of the wages.
- The **trade, transportation, and utilities sector alone accounts for $3.4 billion (2007) in wage earnings** in the Washington-Baltimore corridor region.
- At the end of FY 2007, the Maryland Department of Transportation calculated it had **$13.2 billion (2007) in total assets**; among the capital assets are critical arteries for transportation including the Baltimore Harbor Tunnel, the Fort McHenry Tunnel, the Chesapeake Bay Bridges, and the Francis Scott Key Bridge.
- 2003's **Hurricane Isabel** brought 4-12 inches of rain and storm surges of 6 to 8 feet to Baltimore and Annapolis and cost $462 million. Such extreme weather events will likely be more intense under a scenario of undeterred greenhouse gas emissions (IPCC 2007).
- The Port of Baltimore produces $1.98 billion (2007) in annual economic benefits and provides for 127,000 maritime related jobs. Keeping the **appropriate water depth** is a critical aspect of port maintenance, and the Port of Baltimore dredges its waterway regularly to keep the flow of goods unimpeded. However, if increased levels of trash and sediment continue to deposit in Baltimore Harbor due to increased levels of runoff upstream from flooding, dredging operations could become both more costly and environmentally damaging.
- Commercial **fishing and crabbing** in Maryland generates more than $207 million (2007) annually and **manufacturing** contributes $1.76 billion (2007) in wages – both of which are dependent on reliable access to ports from land and sea. Steadily rising sea levels as well as abrupt non-linear sea level increases could create economic hardships for Maryland's shipping, fishing, and manufacturing industries. A one percent decrease in shipping activity at the Port of Baltimore between now and 2018 would result in an indirect economic impact of roughly $361 million on Maryland's GDP and a loss of more than 3,600 jobs (RESI, 2008).
- Once the **wetlands and barrier islands** that serve as a buffer between communities and the ocean are deteriorated, damage from extreme events will be enhanced. Hurricane damage along the Northeast US coast has cost an estimated $5 billion (2007) per year with much of this cost coming from single major storm events (Frumhoff et al. 2007). For example, Hurricane Floyd ravaged the Eastern shore of Maryland in 1999 when storm water discharge rates reached 100-year levels and total property damage totaled $17.76 million.
- The **insurance sector** will likely face unstable periods as property succumbs to flooding and shoreline inundation For instance, flooding from heavy rains in June of 2006 cost insurers in the Baltimore-Washington region over $25 million (Cohn, 2006). Maryland's finance and insurance sector accounts for $8.5 billion (2007) in wages and salaries and it supplies 4.2 percent of the state's employment base (USBEA 2007). It is predicted that by 2080, insurers' capital requirements to cover the cost of hurricane damage in the US will increase by 90 percent.

Tourism

- In 2006, Maryland's **tourism** generated roughly $11.72 billion (2007) in visitor spending, directly supported 116,000 jobs, and created $920 million (2007) in state and local tax revenue (MOTD 2008). With a weakening coastal infrastructure, beach erosion, and the very real threat of seawater inundation in locations like Ocean City, tourism is likely to suffer in Maryland.
- In 2006, an estimated 166,000 non-Marylanders spent more than $30 million (2007) on wildlife watching in Maryland. However, losses in **eco-tourism** are likely to transpire as a 21% reduction in mid-Atlantic wetlands between now and 2100 hinders shorebird nesting and fish nurseries. **Hunting and fishing** is also big business in Maryland. The US Fish and Wildlife Service (2006) estimated 43,000 people hunted waterfowl in Maryland in 2006, generating $26.23 million (2007) in economic activity (USFWS 2006). As a result of wetlands loss, the economic activity generated by waterfowl hunters will likely decrease. Climate change is a multi-dimensional problem for the Chesapeake Bay's aquatic life.
- In 2006, $308 million (2007) was spent on **recreational saltwater fishing** in Maryland. A 2 percent decrease in out-of-state wildlife watchers between now and 2018 would result in indirect losses to Maryland's GDP of $10 million and a loss of almost 100 jobs (RESI, 2008).

Agriculture

- **Agriculture** is the second-largest land use category in the Mid-Atlantic region after forests (Alber, 2000). The total value of agricultural products in Maryland totaled nearly $1.5 billion (2007) in 2002, with crops accounting for 35% of that value.
- Corn and soybeans make up the two largest volume crops by acreage (USDA, 2002). While an increase in CO_2 concentrations could increase the yields of corn and soybeans, other climate changes will have a net negative effect on yields.
- Although Maryland is expected to receive more precipitation, **droughts may develop** because warmer, more arid temperatures tend to draw moisture out of soil at a rate that offsets increased precipitation.
- Maryland has suffered through **two regional droughts** in the past ten years – one from 1998-1999, and another from 2001-2002. The **first drought caused $800 million in crop losses throughout** the mid-Atlantic region (Kunkle, 1999). Consumers and livestock farmers feel the effects of crop loss in the form of higher food and feed prices. The price of a bushel of corn increased from $2.18 to $2.85/bushel, or 30%, in Maryland between 2001 and 2002 (USDA, 2008).
- Another detrimental effect of climate change on agriculture will be the northern expansion of **invasive species** due to higher temperatures, including warm-season weeds, nematodes, and insects. **Maryland farmers spent $39 million (2007) on pesticides in 2002** and that price will likely increase, but the cost of using more pesticide includes environmental degradation, as well. Runoff from pesticides contributes to degrading freshwater and coastal ecosystems.

Lessons Learned

As we begin to quantify the potential impacts of climate change and the cost of inaction, the following five lessons are observed:

1. There are already considerable costs to society associated with infrastructures, agricultural and silvicultural practices, land use choices, transportation and consumptive behaviors that are not in synch with past and current climatic conditions. These costs are likely to increase as climate change accelerates over the century to come.

2. While some of the benefits from climate change may accrue to individual farms or businesses, the cost of dealing with adverse climate impacts are typically borne by society as a whole. These costs to society will not be uniformly distributed but felt most among small businesses and farms, the elderly and socially marginalized groups.

3. Benefits from climate change may be fleeting -- for example, climate does not stop to change once a farm has benefited from temporarily improved growing conditions. In contrast, costs of inaction are likely to stay and to increase.

4. Climate models and impact assessments are becoming increasingly refined, generating information at higher spatial and temporal resolutions than previously possible. Yet, little consistency exists among studies to enable "summing up" impacts and cost figures across sectors and regions to arrive at a comprehensive, state-wide result.

5. To provide not just a comprehensive state-wide assessment of impacts and cost, but also develop optimal portfolios for investment and policy strategies will require support for integrative environmental research that combines cutting-edge engineering solutions with environmental, economic and social analysis. The effort and resources required for an integrative approach likely pales in comparison to the cost of inaction.