WATER POLICY & CLIMATE CHANGE:

How Could Climate Trends Affect Water Quality Management in New Jersey?

The Clean Water Council (CWC) of New Jersey was established in 1967 to serve as an advisory board to the New Jersey Department of Environmental Protection and to improve the Water Pollution Control Program in New Jersey. The CWC is seeking public testimony on the risks posed to water quality and water infrastructure by climate change and on effective means to adaptively manage the risks. Climate change is causing warmer air and surface water temperatures, more intense storms intermixed with longer periods of dry weather, and rising sea levels. Testimonies are sought on the following questions: (1) What are the high priority risks to clean water posed by the increasing variability of climate and weather events?; and (2) What changes to water management policies are needed to increase flexibility and adaptive management, and how will NJ meet the cost? Specific recommendations are sought by the CWC on issue areas including, but are not limited to the following: stormwater, wastewater, drinking water, in-stream/pass-by flows, agriculture and green industries, and water infrastructure.

This statement has been prepared on behalf of the American Society of Civil Engineers (ASCE), New Jersey section. Water infrastructure has gotten minimum passing grades in the report cards recently prepared by the National and NJ ASCE sections. Aging collection and transmission systems and dwindling financial resources to maintain the critical water and wastewater infrastructure have been the primary reasons for this barely passing grade. The NJ ASCE has been championing the report card and public outreach (entitled Liquid Assets) programs in the state to raise awareness about the infrastructure improvement needs among lawmakers and the municipal/business leaders.

Climate change impacts such as increase in storm intensities, rise in sea levels, or rise in air/water temperatures will impose additional burden on these aging infrastructure. On this 7th Day of December 2009, as a long-time member of the ASCE, I wish to provide this statement on the potential impacts and adaptation strategies. The NJ ASCE endorses this statement as another outreach initiative to raise awareness among the NJ lawmakers and municipal/business leaders about the need for significant attention and investments needed to achieve the goals set forth by the CWC.

STATEMENT

My name is Sri Rangarajan, a licensed professional engineer and a member of the ASCE. I am providing the following statement on behalf of the New Jersey Section (NJ ASCE) on this important topic of water policy and climate change as it relates to the challenges faced by the public and lawmakers of the Garden State.

Water and time have been major healing factors for human beings, and the importance of drinking water supply and wastewater disposal have been recognized very well since the introduction of Clean Water Act in 1972. Great engineering projects have been accomplished in terms of "influencing" the behavior of water to suit human needs – Colorado River diversion, Panama Canal, Three Gorges Dam, and waterfront development in coastal and river systems, to name a few. Time and again, we are reminded by Mother Nature that there is a limit to what humans can do related to "influencing" the water. Instead, it's time for us, the human beings, to recognize the need for "adapting" our lives to the nature of water.

The NJ ASCE will highlight some important challenges faced in the state and provide recommendations for solutions/adaptation.

Combined sewer systems: These systems carry a mixture of sanitary flow from households and businesses and street runoff, and are designed to relieve through outlets when there's excess flow during rainy periods. It's a major water quality concern in the northern and southern parts of NJ, particularly for pathogenic pollution in our waterways and public beaches. These sewers are typically designed for certain design storms and for relieving excess flows during storms larger than the intensity/volume of design storms originally used for sizing. Tides can significantly influence their performance since the excess flows have to overcome the hydraulic pressures exerted by tidal waters against the overflows trying to relieve from these sewers.

Climate change is predicted to influence the storm intensities, tidal water levels, and temperatures. Higher storm intensities are expected to further overwhelm the combined sewers that are already stressed under the existing weather conditions, and increase the volume/frequency of combined sewer overflows. While this will lead to further impairment in the quality of our waterways, the impact within the sewers due to sea level rise can be debilitating. Higher tidal levels can further block the outlets from relieving excess flows, and thereby increase the water levels within sewers and the potential risk of basement or street flooding. Such occurrences cause extensive public health and safety concerns and financial commitments to remediate.

It's impossible to rip up every underground sewer and replace it with bigger or multiple pipes that can handle the volume of runoff. On the other hand, an adaptable solution exists that requires immediate recognition by lawmakers and acceptance by the public/municipalities. It is to

slow down the street runoff so that the combined sewers don't receive them on an instantaneous basis and get overloaded in the first place. This will require individual homeowners and businesses to establish source controls to infiltrate, evapo-transpire, or retain the water where it's generated. Numerous structural and landscaping practices exist to accomplish this "slow-down" goal. Some of these practices productively use stormwater, instead of treating it as "waste" to be simply discharged into the sewers. For example, roof gardens, rain gardens, rain barrels or big cisterns can be used to store water and irrigate plants or lawns well after the rain ends. Other practices such as the redesign of existing stormwater ponds or construction of larger storage tanks at the street block level or underneath ball-fields or park areas can simply store water and release at a slow rate to avoid overloading of sewers. Where there're limited opportunities for infiltration, these storage and slow release practices will work very well. However, to avoid skepticism about their successful use when large storms occur, these green infrastructures should be designed into a "fail-safe" mode to ensure that the properties aren't flooded due to improper design or operation/ maintenance aspects.

This green infrastructure solution fits well in the adaptive planning and management paradigm. Certain green infrastructure elements can be implemented and the improvements can be visualized over time, and additional elements can be included in the future to adapt to the climate change consequences including storm intensities or sea level rises. Is cost going to be the biggest obstacle to this solution? Probably not. Solar system installations have been very expensive, but the State's leadership in providing financial incentives has made it second to the State of California, or on a per capita basis, possibly the first in the country to tap into solar energy. Similar incentives can be envisioned at the state and local levels to optimize the public costs for rehabilitation of sewer systems to adapt to the climate change impacts. Given the right incentives, our state citizens are likely to invest their own resources to achieve the intended goals.

Urban Heat Island Effects: Surface water and air temperatures are predicted to rise due to climate change. These will consequently increase the water and energy consumption at the household or business levels. Most green infrastructure elements aimed at water management will also help in energy management. For example, green roofs or tree canopies will increase the capture of water during rain events, but also increase the shade around to minimize additional air conditioning needs. Increase in storage and reuse of stormwater will reduce the potable water usage for irrigation and cooling tower makeup and washing off of driveways and sidewalks. Germany, for instance, has demonstrated leadership in the ways of implementing green walls and water reuse that achieve both water and energy optimization. Australia, on the other hand, leads the grey water reuse applications. Japan, for example, promotes the use of treated effluent from wastewater treatment plants to be used for cooling pavement areas to mitigate urban heat island effects. Flexible policies, thorough evaluation and application of appropriate technologies, and financial incentives can help our state in following the footsteps of other developed countries in the management of our water resources.

Source Water Supply: Majority of source water supply for NJ residents is tapped from the Delaware, Raritan and Passaic Rivers. One of the consequences of climate change on rainfall is to potentially increase the duration between events. On a long-term basis, this phenomenon also will increase the duration of drought periods, and thereby, decrease the reliability of source water supply from our surface waters. Groundwater can be a supplemental source, but remember that surface waters recharge the ground to enhance the groundwater yield for water supply.

Water conservation and reuse are going to be inevitable. In most of New Jersey, we're blessed with good amounts of rainfall distributed over the entire year, unlike some portions of the country that receive rainfall during one or two seasons or in traces. At the same time, our population rate is growing and water demands are increasing. More aggressive or mandated water conservation measures are necessary to ensure that the public and businesses adopt low-flow plumbing fixtures or limit the manicured lawn areas to reduce the potable water consumption. Sensor-based irrigation systems that track soil moisture must be implemented in lieu of the time-based systems that trigger even during rainy days. Recharge and storage of source water (e.g., low elevation dams) may be necessary as adaptation measures to enhance the water yield. Necessity is the driver for invention and innovation in water management. In Southern California, even the treated wastewater effluent is not wasted, but is used to recharge the aquifers or stored in lakes for future water supply needs.

In addition, the local and state water management agencies should undertake initiatives that will reduce the vulnerability from future droughts. Where possible, the drought mitigation plans should include public information and education campaigns, ongoing water conservation programs, water use restrictions, water transfers from region to region, water transfers from agricultural to municipal/industrial uses, conjunctive use, and local sharing of supplies and facilities. Drought preparedness and response plans need to be in place to facilitate water management even during extended dry periods.

Urban Stormwater Management: The potential impacts on combined sewers were discussed previously. However, the increases in storm intensities or sea levels will also have profound impacts on municipal stormwater pipes, pumping stations, and finally the rivers/creeks

that convey stormwater to the ocean. These stormwater infrastructures do not get the necessary operation and maintenance due to competing priorities and also due to those being "out of sight." Recent regulations on stormwater aimed at streambank protection, erosion control, and water quality improvements impose significant financial burden on the local governments to comply with such regulations. The climate change consequences will further increase the stress on these infrastructures and the associated financial burden. A streamlined public outreach process is warranted to communicate the importance of these underground infrastructures in protecting homes and businesses from flooding and also in maintaining the recreational benefits of our waterways. A statewide stormwater utility program needs to be envisioned as a sustained and dedicated funding source for rehabilitation or replacement of failing water, wastewater, and stormwater infrastructure elements. While the developed countries in Europe and Japan spend a significant fraction of their GDP on infrastructure improvements, we in the U.S. spend far less on these important infrastructure elements.

Coastal Protection: Waterfront development has attracted the public and developers equally over the past three decades, and this situation has resulted in uncontrolled or unplanned growth in certain coastal areas including the Barnegat Bay, Raritan Bay and in some freshwater systems such as the Delaware and Raritan Rivers. Increases in impervious covers near the waterways can increase soil and channel erosion and also associated pollutants including nutrients and pathogens. These impacts, together with the change in storm intensities and temperatures, could require modified agricultural practices and measures, water supply and quality impairments, and the potential for the outbreak of diseases.

Some communities in Florida, for example the Charlotte Harbor, have begun to adapt to sea level rise by raising the living floors well above the historical maximum water/tide levels. They also have increased the extent of coastal wetlands (e.g., Mangroves) to slow down the erosion and to protect the properties and businesses during storm surges. The Dutch government has implemented sea barriers to protect economic centers and properties from significant sea level rises.

The US Environmental Protection Agency (EPA) has been developing water quality protection plans for the New York/New Jersey Harbor (called Total Maximum Daily Loads, TMDLs) for pathogens, dissolved oxygen/nutrients, and toxic contaminants. It is likely that waste load allocations and load allocations to meet these TMDLs will involve large capital expenditures from the municipal/county governments. Once these harbor-wide TMDLs are established, the government agencies may be required to undertake capital projects to reduce the necessary pollutant loads to our waterways. Climate change impacts can alter the basis for establishment of these TMDLs and it would be necessary to re-evaluate whether or not the established TMDLs for present conditions would meet water quality standards under the future under conditions of increased temperature, altered precipitation, and sea level rise.

Since adaptation appears to be a necessity instead of an option, the master planning undertaken by coastal municipalities should recognize the economic and public safety aspects and limit the future development from occurring or moving of existing homes/businesses from vulnerable areas. This risk mitigation paradigm will achieve cost effective adaptation strategies without exerting excessive financial burden on these communities to just protect a few homes or businesses in these vulnerable areas. Proper regulation of coastal and offshore development will result in sound conservation practices and protection of public health and safety and the

environment. In order to promote cooperation and efficiency, the NJ ASCE supports the establishment of a lead agency to be in charge of coordination and the establishment of procedures/ protocols for uniformity in municipal ordinances to achieve coastal resource protection and public safety/health goals.

Finally, is it going to be easy? Is it going to be cheap? Probably not, but the timing can never be more critical than now, if we want our children and their generations are to enjoy the same level of opportunities and resources related to water resources management.

The NJ section of ASCE appreciates this opportunity to provide a statement to highlight the importance of water resources/water infrastructure issues in the state and will be very happy to assist in anyway to improve the technical, regulatory, public outreach, and financial aspects that we're challenged with.