Long Island Sound (LIS) is a dynamic, temperate, urban estuary that is under continuous stress from both a megacity at its western end and steadily increasing development across the NY and CT coastlines. In addition to human stressors, shifts in climate and projected warming trends also stand to alter the state of LIS. Here we review what we know and don’t know about the LIS system in terms of its biogeochemistry, forcings and feedbacks and how these will translate in future climate scenarios. By identifying these processes we can inform future management and development across LIS to plan for protecting this important ecosystem and preventing deterioration of and/or even improving LIS water quality.