

RETHINKING STORMWATER MANAGEMENT IN A CHANGING WORLD: EFFECTS OF DETENTION FOR FLOODING HAZARD MITIGATION UNDER CLIMATE CHANGE SCENARIOS IN THE CHARLES RIVER WATERSHED

CHENG, CHINGWEN

Department of Landscape Architecture and Regional Planning, 109 Hills North, 111 Infirmiry Way, University of Massachusetts, Amherst, MA 01003-9328, chingwen@larp.umass.edu

BRABEC, ELIZABETH A.

Department of Landscape Architecture and Regional Planning, 109 Hills North, 111 Infirmiry Way, University of Massachusetts, Amherst, MA 01003-9328, ebrabec@larp.umass.edu

YANG, YI-CHEN E.

Department of Civil and Environmental Engineering, E Lab II, 101 North Service Road, University of Massachusetts, Amherst, MA 01003-9328, yceyang@engin.umass.edu

RYAN, ROBERT L.

Department of Landscape Architecture and Regional Planning, 109 Hills North, 111 Infirmiry Way, University of Massachusetts, Amherst, MA 01003-9328, rryan@larp.umass.edu

1 ABSTRACT

Climate change is projected to have impacts on increased temperature as well as frequent and intense rainfalls in the northeast region of the United States. Integrated green infrastructure planning with both structural and non-structural stormwater management practices has emerged as a critical climate change adaptation strategy. Under the uncertainty of climate change impacts on long-term flooding hazards, this paper employed SWAT hydrological modeling for an empirical study examining the effectiveness of using detention area for the mitigation of a 45-year period riparian flooding hazard under 36 climate change conditions. Statistical results illustrated a weak yet positive effect of using detention for flooding hazard mitigation. A range of from 12 to 18% and 0 to 8% of the drainage area would be required for on-site detention in order to achieve policy goals for zero flooding hazard indices and to the level of current climate conditions respectively. Under the constraints of limited adaptive uses of lands or the availability of large land areas for natural detention in the urbanized watershed, this paper suggested that innovations in employing on-site detention techniques in impervious and non-natural pervious areas play an important role in mitigating climate change-induced flooding hazards. Integrating on-site detention functions (wet and dry detentions) as part of the green infrastructure network in urban stormwater management systems is therefore crucial in landscape architecture planning and design practices for climate change adaptation.

1.1 Keywords

detention, climate change, flooding hazard mitigation, green infrastructure