



Mapping the Green Infrastructure potential - and it's water-energy impacts on New York City roof Tops

Rebecka Engström (1,2), Georgia Destouni (2), and Mark Howells (1)

(1) Unit of Energy Systems Analysis, KTH Royal Institute of Technology, Stockholm, Sweden (rseg@kth.se), (2) Department of Physical Geography, Stockholm University, Stockholm, Sweden (rebecka.engstrom@natgeo.su.se)

Green Roofs have the potential to provide multiple services in cities. Besides acting as carbon sinks, providing noise reduction and decreasing air pollution - without requiring any additional "land-use" in a city (only roof-use), green roofs have a quantifiable potential to reduce direct and indirect energy and water use. They enhance the insulating capacity of a conventional residential roof and thereby decrease both cooling demands in summer and heating demands in winter. The former is further mitigated by the cooling effect of evapotranspiration from the roofs

In New York City green roofs are additionally a valuable component of reducing "combined sewer overflows", as these roofs can retain storm water. This can improve water quality in the city's rivers as well as decrease the total volume of water treated in the city's wastewater treatment plants, thereby indirectly reduce energy demands.

The impacts of green roofs on NYC's water-energy nexus has been initially studied (Engström et. al, forthcoming). The present study expands that work to more comprehensively investigate the potential of this type of nature-based solution in a dense city. By employing Geographical Information Systems analysis, the roof top area of New York City is analysed and roof space suitable for green roofs of varying types (ranging from extensive to intensive) are mapped and quantified. The total green roof area is then connected with estimates of potential water-energy benefits (and costs) of each type of green roof. The results indicate where green roofs can be beneficially installed throughout the city, and quantifies the related impacts on both water and energy use. These outputs can provide policy makers with valuable support when facing investment decisions in green infrastructure, in a city where there is great interest for these types of nature-based solutions.