factsheet

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Key research findings

Forests and water

What policymakers should know

- **Giant sponges:** Forests act as giant sponges, soaking up rainfall during wet seasons and slowly releasing it during times of drought. Forests provide natural filtration and storage systems that supply an estimated 75 percent of usable water globally. Tree roots and leaf litter create conditions that promote the infiltration of rainwater into the soil and then into the groundwater, providing supplies during dry periods.[1]

- **In dollars:** There are a range of estimates for the value of water regulation and supply. One study puts the figure at USD 2.3 trillion[2] globally. Another study, focused at the national level in China, estimates that the value of the water storage function of that country's forests is estimated as 7.5 trillion yuan (approximately USD 1 trillion); three times the value of the wood in its forests.[3] Another study calculated that the presence of forest on Mount Kenya saved the country's economy more than USD 20 million by protecting the catchment for two of Kenya's main river systems: the Tana and the Ewaso Ngiro.[3] Today, at least one third of the world's biggest cities, such as New York, Singapore, Jakarta, Rio de Janeiro, Bogotá, Madrid and Cape Town, draw a significant portion of their drinking water from forested areas.[4]

- **Removing pollutants:** Trees and forests improve stream quality and watershed health by decreasing the amount of storm water runoff and pollutants that reach local waters. They take up nutrients and pollutants from soils and water through their roots, and transform them into less harmful substances.[5] Forests also maintain high water quality by minimising soil erosion and reducing sediment. Deforestation generally increases erosion, resulting in higher sediment concentrations in the runoff and siltation of watercourses.[6]

- **Flood protection:** The capacity of forests to reduce the incidence and severity of downstream flooding associated with major rainfall events may be more limited than is commonly thought. Nevertheless, maintaining natural vegetation in catchments and riparian zones can reduce flash flooding and flood peaks through the sponge effect of standing forests, and diminish the damaging impacts of local floods by blocking the path of the water with tree trunks, branches and other forest litter.[7]

- **Global significance:** Recent research[8] highlights the global significance of forests in recycling rainfall and groundwater to support continental-scale and intercontinental-scale hydrological cycles. At these scales, forest loss and degradation appear to have deleterious effects on rainfall.[9] These results suggest that forest–water relations at the continental and intercontinental scales are different from those at a catchment scale, where deforestation can increase water yield in the catchment.

- **Examples of continental-scale impacts:** Deforestation and forest degradation in one area can impact rainfall patterns in other parts of the world. Moisture evaporating from the Eurasian continent is responsible for 80 percent of China's water resources. In South America, the Río de la Plata Basin depends on evaporation from the Amazon forest for 70 percent of its water resources. The Congo Basin is a major source of moisture for rainfall in the Sahel.[10]

Notes

1 Center for Watershed Protection and US Forestry Service. Watershed Forestry Research Guide. 2008. http://www.forestsforwatersheds.org/reduce-stormwater/

2 Costanza, R., d'Arge, R., de Groot, R., Farberk, S., Grasso, M., Hannon, B., Limburg, K., Shahid Naeem, I., O'Neill, R., Paruelo, J., Raskin, R., Sutton, P. & van den Belt, M. 1997. The value of the world's ecosystem services and natural capital. Nature, 387: 253–260.

3 Stolton, S. & Dudley, N., Managing forests for cleaner water for urban populations. Food and Agriculture Organization (FAO). http://www.fao.org/docrep/010/a1598e/a1598e10.htm

4 Global Environment Facility. 2011. Forests are key for high quality water supply. http://www.thegef.org/gef/press_release/2011_IYF_forest_for_water.

5 Center for Watershed Protection and US Forestry Service. Watershed Forestry Research Guide. 2008. http://www.forestsforwatersheds.org/reduce-stormwater/

6 Calder, I., Hofer, T., Vermont, S. and Warren, P. 2007. Towards a new understanding of forests and water. Unasylva Vol. 58, No. 229. FAO: Rome. http://www.fao.org/docrep/010/a1598e/a1598e02.htm

7 Food and Agriculture Organization & the Center for International Forestry Research, Forests and floods: drowning in fiction or thriving on facts? 2005. http://www.fao.org/forestry/11722-0aea9fb9406230267eaf9955570ec42f3.pdf

8 Ellison, D., Futter, M.N. and Bishop, K. 2012 On the forest cover–water yield debate: from demand- to supply-side thinking. Global Change Biology 18 (3): 806–820.

9 Hirota, M, Oyama, MD, Nobre C. 2011. Concurrent climate impacts of tropical South America land-cover change. Atmospheric Science Letters 12: 261-267.

10 van der Ent, R. J., Savenije, H. H. G., Schaefli, B. and Steele-Dunne, S. C. 2010 Origin and fate of atmospheric moisture over continents, Water Resources. Research, 46, W09525, http://dx.doi.org/10.1029/2010WR009127..

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