Annex 9D. Intervention Sustainability

Supplemental material for: Hutton, G. and C. Chase. 2017. Water Supply, Sanitation, and Hygiene. In *Disease Control Priorities* (third edition): Volume 7, *Injury Prevention and Environmental Health*, edited by C.N Mock, R. Nugent, O. Kobusingye, and K.R. Smith. Washington, DC: World Bank.

WASH intervention sustainability can be examined from several economic angles – the efficiency of averting water resources pollution, the efficiency of energy use in WASH service provision (and reduction in greenhouse gas emissions), and financial sustainability. The latter is covered in section V.7.

Environmental cost-effectiveness studies compare the costs of achieving pollution or nutrient emission reductions through different approaches to wastewater or fecal sludge management (Lise and Van der Veeren 2002; Randall 2003). The majority of studies have been conducted in developed countries.

The energy-water nexus is now coming to the fore, raising the issue not only of the energy requirements of water supply and wastewater systems (including transport, treatment and disposal), but also the resulting over extraction of groundwater resulting from energy subsidies and polluted surface water. In India and Mexico, for example, subsidized electricity and kerosene for farmers has led to serious groundwater overdraft (Scott and Shah 2004). Municipal water supply is also being sourced from further away in several mega-cities (e.g. Beijing, Metro Manila, Dhaka, Mexico City) due to declining water tables and polluted local surface water such as natural lakes and rivers, thus costing tens of billions of dollars in reservoir, pipeline and/or pumping costs.

Wastewater transportation and treatment require considerable amounts of energy. Evaluations of alternative wastewater treatment systems show that wetland systems use can use as little as 15% of the purchased energy of conventional sewage systems (Nelson, Odum et al. 2001). Furthermore, the systems vary in terms of their greenhouse gas emission (Préndeza and Lara-González 2008). Emissions can be cost-effectively reduced by capturing methane emission and using it as a source of energy for the rest of the treatment process (Keller and Hartley 2003).

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