

Choosing metrics that matter – quantifying performance to help address reservoir operation challenges in Kenya’s Tana basin

ANTHONY P. HURFORD^{1,2} & JULIEN J. HAROU²

*1 HR Wallingford, Howbery Park, Benson Lane, Wallingford OX10 8BA, UK
a.hurford@hrwallingford.com*

2 University College London, Department of Civil Environmental and Geomatic Engineering, Chadwick Building, Gower Street, London WC1E 6BT, UK

Abstract A system of five hydropower plants on Kenya’s Tana River (the Seven Forks project) currently provides three-quarters of Kenya’s electricity. Operating the hydropower dams to support economic development without reducing hydropower generation, water supplies or ecological function is a challenge. We developed a range of performance metrics within an open-source water resources simulator (IRAS-2010) to help gauge success in this effort. Modifying reservoir operating rules enhances performance in particular metrics but lowers others, demonstrating the existence of trade-offs. Financial benefits of hydropower generation and agriculture are assessed alongside non-monetary benefits accruing from a natural flow regime. Pre-dam development flow time-series are used to represent both the range of hydrological conditions experienced in the basin and the ecological flow requirements. The maximum-to-minimum ratio of individual performance metrics varies from 1.75 to ∞ (where zero is the best performance) suggesting different operating rules lead to a wide range of performances.

Key words Tana River; Kenya; economic development; ecosystem services; hydropower; performance metrics; IRAS-2010; reservoir operating rules; trade-offs