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Towards an understanding and application of environmental flow requirements for human welfare in East African Rivers

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In semi-arid regions of Africa, rivers are of vital importance to humans for the many direct ecosystem services they provide and, in some cases, for their potential to irrigate and power larger-scale development. More than in most regions of the world, Africans still rely individually on rivers for domestic water, nutrition, and other materials contributing to their daily welfare. This has led to a uniquely African adaptation of the environmental flow concept to incorporate the basic water needs of people as well as ecosystems. The combined flow is referred to as the 'Reserve'. East Africa has seen comparatively little development of its water resources to-date, but ambitious initiatives are underway to increase water use in new large-scale irrigation schemes and hydropower projects. Consequently, a number of comprehensive environmental flow assessments and ecohydrological research activities have recently been carried out in the region. This presentation briefly reviews the initiatives underway across the region but focuses mainly on combined research and flow-setting efforts in the transboundary Mara River Basin of Kenya and Tanzania, home to more than 800,000 people and the region's most popular conservation areas, Masai-Mara National Reserve and Serengeti National Park.

Since 2006 a team of scientists, in cooperation with water authorities and the World Wide Fund for Nature (WWF), has investigated the hydrology, hydraulics, biology, and human uses of the Mara River in order to make initial environmental flow (reserve) recommendations. The flow regime of the still largely unregulated Mara River, based on analyses or 20+ years of data from three gauging stations, is highly variable and perennial flow in the middle reaches is dependent on inflows from two tributaries draining the heavily deforested Mau Escarpment, one of Kenya's five water towers. Downstream flows are also seasonally influenced by inflows from ephemeral tributaries that drain degraded grazing lands. Environmental flow recommendations have been made at six locations along the river, including three sites destined for the construction of new dams and multipurpose reservoirs. Flow recommendations consist of variable mean monthly base flows during normal and drought years and medium to large floods timed to achieve specific ecological objectives. The objective of water authorities, and thus of environmental flow recommendations, is to conserve the current good ecological status of the river and the many services it provides to people living along its margins. Complimentary research on the interrelationships between flow variability, ecosystem function, and human welfare is turning the Mara into a model system for better understanding these dynamics in an African development context.