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The Unintended Consequences of Development Assistance: The Case of Usangu in Tanzania

Peter Coppolillo, Wildlife Conservation Society;
Deana Clifford and Jonna Mazet, University of California, Davis
Health for Animals and Livelihood Improvement (HALI) Project

Research Brief 08-02-HALI November 2008

Three smallholder rice irrigation schemes were established with development assistance in Tanzania in the 1980s and early 90s aimed at improving agricultural livelihoods in the region. The projects did not accomplish their stated goals, but more problematically, they precipitated a cascade of unintended consequences. The primary effect was that legal channelization of water catalyzed illegal diversions and satellite farms surrounding the rice schemes. The resultant loss of water was (and remains) the central driver in a cascade of unintended environmental and socioeconomic effects including: a 77% reduction in the area of the Ihefu swamp, the important wetland habitat of the Great Ruaha River; over 60% loss of dry-season habitat in Ruaha National Park; the collapse of fisheries in Mtera Reservoir; increased potential for transmitting zoonotic disease; and the loss of electricity produced by the Mtera Hydroelectric Plant. The social and economic costs of these unintended consequences remain untallied, but the power crisis alone likely cost the Tanzanian economy approximately one billion U.S. dollars. This case highlights the need for development assistance to control the genesis and propagation of unintended consequences which could vastly outweigh the benefits of the assistance program. Furthermore, the perception that developing countries, like Tanzania, are not financially able to manage water sustainably should be replaced by the idea that those countries cannot afford the consequences of unsustainable water resource management.

Background

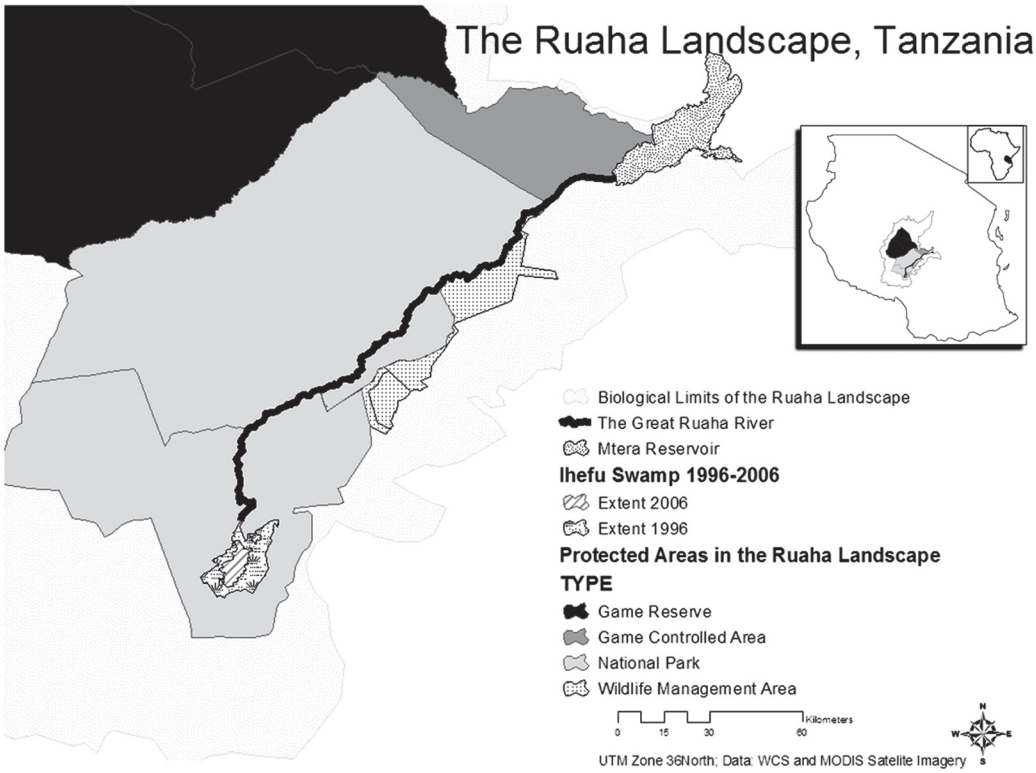
Tanzania is among the world's poorest countries, ranking 159th out of 177, according to the Human Development Indices' calculations. This need, combined with abundant land and natural resources, a peaceful and relatively well-governed political environment and a rapidly growing economy make Tanzania an attractive recipient for bi- and multi-lateral development assistance. Assistance in 2005 amounted to around $US 1.5 billion or about 12% of GDP (gross domestic product) in Tanzania (SIDA-Swedish International Development Cooperation Agency, 2006). In many cases, this support has led to significant improvements in livelihoods, environmental outcomes and quality of life, but the net effects of development assistance are not universally positive. Here, researchers examine a case where the unintended negative consequences of development assistance vastly outweigh the positive benefits and attempt to identify practical ways to avoid similar outcomes in the future.

The Usangu Plains of central Tanzania had fertile soil, abundant sunshine and natural wetlands that supported both rain-fed and traditionally irrigated rice systems. Starting in the mid 1980s with support from the British, Dutch, and Chinese governments as well as the World and African Development Banks, these traditional systems were "improved" through provision of cement-lined delivery canals and industrial-scale paddies parceled out to smallholders. The idea was to use modern irrigation techniques to grow more rice overall, more rice per hectare, and to do so more efficiently in terms of water use (SMUWC-Sustainable Management of the Usanga Wetland and its Catchment, 2001).

Unfortunately, the irrigation projects never realized any of these goals (Lankford, 2004; Lankford et. al, 2004). Far more destructively, by channeling the water, the schemes made it possible to divert much larger proportions of the rivers feeding into the Usangu Plains. As a result – in the dry season of 1993 and for the first time in living memory - the Great Ruaha River stopped flowing.

The cessation of flow was totally unanticipated, having serious implications for downstream irrigators and effects on other costs, both ecological and economic. Specifically, Ruaha National Park (now Tanzania's largest national park) was impacted because the Great Ruaha River was the principal water source for the southern half of the Park. The Great Ruaha also carries over 60% of the water flowing into Mtera Reservoir, which supports central Tanzania's only significant fishery; generates 80 Megawatts (MW) of electricity; and provides storage for Kidatu Hydroelectric Plant, which generates 200 MW. Combined, Mtera and Kidatu provide over 70% of Tanzania's electricity.

Recognizing the potential costs, DFID (the UK Department for International Development) funded



the Sustainable Management of the Usangu Wetland Catchment program, a four million dollar research initiative. Numerous hydrological studies documented the amounts of water diverted, but little attention was paid to the areas outside the internationally-funded irrigation schemes. Economic studies established that Great Ruaha River water was eight times more valuable for hydropower than for rice, but the DFID funded research did little to improve the flow of the Great Ruaha River, and hence reverse some of the negative impacts of the irrigation projects on the surrounding ecosystem and its inhabitants.

In 2003, the severity of the drying of the Great Ruaha continued to intensify. The effects of the drying on ecosystem services and flow requirements, however, remained un-quantified making it impossible to apply Tanzania's Water Policy, which gives "Environmental Flows" priority over economic activities (and behind domestic water use). In response, the Wildlife Conservation Society (WCS) Ruaha Program set out to identify the flow regimes necessary to sustain the ecosystem services provided by the Great Ruaha, namely, provision of hydropower and maintenance of dry-season wildlife habitat (which supports ecotourism, now Tanzania's largest economic sector).

Major Findings

Quantifying the ecological effects of river drying showed that over 60% of dry season habitat in the Ruaha National Park was eliminated as the Great Ruaha River dried. The effects, however, were not just downstream. The Ihefu Swamp—where the Great Ruaha flows from the Usangu Plains—lost 77% of its surface area and was fragmented into three sections. Not only was its hydrological function threatened, but its decline represents a significant loss of wetland habitat.

In re-examining the factors contributing to river drying, more unanticipated results were uncovered. Most analyses of diversions focused on the sanctioned rice schemes, which intended to divert around 20-30% of the Great Ruaha's flow. Receiving far less (if any) attention were the illegal diversions feeding a proliferation of smaller 'satellite farms' surrounding the developed farms. These satellite farms substantially increased the area flooded. A satellite image analysis comparing illegally flooded areas in satellite farms to those in the irrigation schemes revealed a ratio of 50:1, respectively. Furthermore, very few of the satellite farms were properly leveled, requiring constantly flowering water to keep rice wet. Worse still, almost none of the satellite farms have canals to return river water after irrigation. The small scale satellite farms thus consume significantly more water than the large scale irrigation systems but have been ignored in research and policy discourses.

The hydrological effects of livestock were also examined, along with the social and political drivers affecting pastoral land use and land tenure. In the course of these discussions, pastoralists argued that the loss of water sources forced

The flowing Great Ruaha riverbed in December (left) and the dry riverbed in October (right). The drying of this normally perennial river may increase disease transmission among people, livestock, and wildlife, as all are forced to share diminishing dry season water sources. Flowing Ruaha photo by Deana Clifford. Dry Ruaha photo by Peter Coppolillo.

livestock to move further seasonally and to be compressed during the dry season. These two factors, they argued, substantially increased the transmission of diseases among livestock herds and between livestock and wildlife, which were increasingly forced to use the same water holes. Now, over a decade after river drying, secondary consequences of rice development appeared. In 2006, Wildlife Conservation Society, University of California, Davis and Sokoine University of Agriculture initiated the HALI project (Health for Animal and Livelihood Improvement) to better understand how zoonotic disease was affecting livestock, human and wildlife health. The HALI project is now investigating the health and economic consequences of water shortage on livestock and pastoralists in the Ruaha ecosystem.

Other secondary effects are also affecting human and wildlife health. Stagnant water can be poisoned, and the concentration of wildlife at water holes means that many animals can be poisoned at a single point. With the drying of the Great Ruaha River, illegal "hunters" have resorted to poisoning water holes and selling the meat in villages. The HALI project is examining the socioeconomics of protein availability in target villages to understand whether this kind of threat can be alleviated by increasing the availability of animal-source protein in villages.

While the problems outlined above had significant economic and ecological effects locally, the unintended consequences of rice development in Usangu were scarcely recognized outside the local context. In 2006, however, on the heels of a prolonged drought, low flows and the drying of the Great Ruaha River forced the complete closure of the Mtera Hydroelectric Plant and a 50% reduction of hydropower generation at Kidatu. These reductions reportedly cost TANESCO (Tanzania's Parastatal electricity utility) around $US 200,000 each day. The aggregate costs to Tanzanian economy from the loss of electricity were estimated between $US two-nine million each day. HALI researchers know of no published estimates of the total cost of the overall economic loss from the power crisis, but simple extrapolation of the daily estimates yields losses between $US 360 million and 1.6 billion. This higher figure exceeds the estimated amount of all bi- and multi-lateral aid flowing into Tanzania each year.

In summary, the details of the Usangu case make it clear that the economic value of rice development, even if the projects' goals had been realized, was swamped by a cascade of unintended and negative consequences arising from the projects themselves.

Practical Implications

It is tempting to view the Usangu Rice Development projects as unmitigated failures, given that they achieved none of their stated goals and have had catastrophic effects on the local environment and livelihoods throughout Tanzania. Dismissing the case in this way, however, abdicates responsibility and misses an important opportunity to learn from and rectify the mistakes made.

A number of clear practical lessons are apparent. First, establishment of the Usangu Rice projects focused on technical issues of agronomic efficiency and economic yields, without sufficient attention to enforcement and regulation. In a country like Tanzania, where resource use is often regulated by technological and practical constraints, the existing institutions were not prepared to deal with the scale and magnitude of use made possible by channelizing water. Because of this, 15 years after the initiation of projects, the unanticipated burden on water resources stemming from illegal channeling continues to threaten the sustainable management of local livelihood activities as well as habitat conservation efforts.

More directly related to HALI, the unintended consequences and their economic and ecological effects are still being recognized 15 years after the first year of drying. While this underscores the inadequacy of the initial environmental impact assessments (EIAs), it is also clear that more significant investment in more responsible EIAs probably would not have anticipated all the problems observed today. Like Usangu, most parts of the developing world have great and immediate needs, and background data are generally lacking. More significant and integrative EIAs will undoubtedly reduce the incidence of similar cascades in the future, but environmental assessment of development assistance projects must not end at the initiation of the projects. Instead, donor countries must ensure that monitoring and adaptive management of unintended environmental, social, and economic consequences are built into the implementation and operation stages of assistance projects. Such regulation is imperative to ensure effective and ethical development assistance.

Finally, rural livelihoods and zoonotic diseases remain broad, weakly defined issues for which "baseline" data rarely exist. Yet, the Usangu Case highlights how development assistance can affect rural people, their livestock and ecosystem health through indirect pathways. Monitoring alone cannot anticipate all of the unintended consequences of development assistance. Only through integrative and multi-year research will the development community understand and ultimately improve the efficacy and responsibility of development assistance to countries like Tanzania.

Further Reading

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About the Authors: At the time of writing, Dr. Peter Coppolillo was Director of the Ruaha Landscape Program for the Wildlife Conservation Society. He is currently the Coordinator of the Yellowstone Rockies Program. Email: PCoppolillo@WCS.org. Dr. Deana Clifford is the HALI Project Coordinator and postdoctoral researcher at the Wildlife Health Center in the School of Veterinary Medicine, University of California, Davis. Email: dlclifford@ucdavis.edu. Dr. Jonna Mazet is a Professor of Wildlife Epidemiology and Co-Director of the Wildlife Health Center at the University of California, Davis. Email: jkmazet@ucdavis.edu.

The Health for Animals and Livelihood Improvement (HALI) project was established in 2006 and is a stakeholder-driven research and capacity-building program to assess the effects of zoonotic disease and water management on animal health, biodiversity, and livelihoods in the Ruaha ecosystem, Tanzania. The project is led by Dr. Jonna Mazet, University of California, Davis. Email: jkmazet@ucdavis.edu.

The Global Livestock CRSP is comprised of multidisciplinary, collaborative projects focused on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk in a changing environment. The program is active in East and West Africa, Central Asia and Latin America.

This publication was made possible through support provided by the Office of Agriculture, Bureau of Economic Growth, Agriculture and Trade, under Grant No. PCE-G-00-98-00036-00 to University of California, Davis. The opinions expressed herein are those of the authors and do not necessarily reflect the views of USAID.

Edited by Franklin Holley & Susan L. Johnson