32nd WEDC International Conference, Colombo, Sri Lanka, 2006

SUSTAINABLE DEVELOPMENT OF WATER RESOURCES, WATER SUPPLY AND ENVIRONMENTAL SANITATION

Water resource management capacity in Tanzania: insights from responses to climate extremes

Nick Hepworth and Declan Conway, University of East Anglia, United Kingdom

This paper analyses impacts and responses to floods and droughts as perceived by the Tanzanian river basin management community, in order to review capacity in light of donor supported 'Integrated Water Resource Management' (IWRM) reforms. We find that climate extremes, including the 2005-06 drought continue to act as significant breaks on development and that organisational responses and preparedness for recurrent drought over a decadal cycle, when compared to an idealized framework and regional benchmark, are lacking. That existing capacity falls short, despite over ten years of substantial donor support in implementing IWRM, clearly has important ramifications. Key insights point to the need for a more situated understanding of capacity building needs for the practice of IWRM and a need to refocus on adequate funding and political support for 'front line' work. To capture this we present 'regulatory personality' as a new concept around which to rally capacity building efforts.

Introduction

Tanzania's economy based on agriculture and powered largely by hydropower is heavily dependent on the availability of water resources. The effective management and regulation of water resources and their use is therefore a fundamental pre-requisite for achieving the country's development goals (URT_1 2005). With this in mind, as in many other developing countries, institutional reforms have taken place in Tanzania over the past decade under the banner of Integrated Water Resource Management (IWRM). Based on operationalising a system of Integrated River Basin Management (IRBM) that has been in place in Tanzania, at least on paper since 1974, these reforms have taken place with the support of development partners, funded primarily through World Bank loans, in particular the $30 million 1996-2002 River Basin Management and Small-holder Irrigation Improvement Project (RBMSIIP).

It is sensible to assume that the effectiveness of institutional frameworks for water resource management and the organisations that implement them are most sharply tested during climatic extremes. Analysis of the impacts and organisational responses to drought and flood events, including the recent drought of 2005-6, therefore provide a revealing and timely measure of the efficacy of institutional reforms, water resource management capacity and donor support to the country's water sector.

The institutional framework for water resource management in Tanzania

Under the Water Utilization Act of 1974 all waters in Tanzania are vested to the government, which aims to manage water resources at the basin scale through nine Basin Water Offices (BWOs) under the Ministry of Water (MoW). The BWOs, comprising teams of technicians, engineers and support staff and headed by a Basin Water Officer (BWO) are the competent authorities for all aspects of water resource management. Advised by a Basin Water Board with members appointed by the Minister, their duties include regulating, monitoring and policing water use; issuing of water use permits and collection of water use fees; monitoring operations of hydropower generation reservoirs; assisting in the formation of water users' associations (WUAs); constructing irrigation control gates; awareness creation around water use; monitoring and control of water pollution; and participation in water related projects in the basin. Other ministries such as the Ministry of Agriculture and Foods Security (MAFS) and the Ministry of Energy and Minerals (MEM) retain significant influence as major water users.

Data collection and methodology

Data on exposures and responses to climate extremes and capacity for managing impacts were generated through key informant interviews and a questionnaire survey completed by twenty-one professionals from within the basin management community in Tanzania. Respondents included officers of the Ministries of Food Security and Water (including BWOs) and from a third grouping of academics, a consultant, a local NGO (Traditional Irrigation Programme) and an international NGO (the World Wide Fund for Nature, WWF) working to support river basin management. In addition, key policy documents such as the National Water Sector Development Strategy (NWSDS), the National Strategy for Growth and Reduction of Poverty (NSGRP), together with project and programme reports and the national media were reviewed.

All respondents have been involved in or are familiar with donor-supported projects to support IRBM. These include the RBMSIIP, $10.6 million of which was targeted at strengthening river basin management with around 60% of this targeted at the Rufiji and Pangani catchments specifically (World Bank 1996), and three initiatives funded by the UK's Department for International Development (DFID) focusing on the Rufiji Basin (Sustainable Management of the Usangu Wetland and its Catchment, SMUWC, 1999-2001; Raising Irrigation Productivity and Releasing Water for Intersectoral Needs, RIPARWIN, 2001-2005 and the WWF's ongoing Ruaha Water Programme)

Over half of the respondents related their answers to the Rufiji Basin, with additional responses relating to either the whole of Tanzania or to two additional catchments, the Pangani and Wami-Ruvu. The levels of organisational memory represented by the years of service of those consulted varies and we attempt to account for such temporal and spatial influences on the responses in the representation and analysis of the data. In doing so we judge the exercise to represent the experiences and perceptions of those practicing and supporting river basin management in Tanzania and thus to reveal useful insights around countrywide capacity issues.

The questionnaire comprised of several sections to elicit:

- The perceived significance of climatic variability and its role in dictating the availability of water resources within the wider context of basin management.
- Past exposure to major drought and flood events, their impacts and organisational responses and perceptions of trends in climatic extremes.
- Levels and nature of existing capacity for management in response to climate extremes.
- Organisational challenges facing river basin management, the constraints and opportunities for mobilising capacity.

The social and economic impacts of climate extremes and water resource availability in Tanzania

As the foundation of the Tanzanian economy, agriculture accounts for just under half of the national GDP (47.5%), three quarters of exports and provides a source of food, employment and livelihoods for 80-85 percent of the population or around 26.5 million people (URT_2 2005). It has forward linkages to the non-farm sector through agro-processing, consumption and export; provides raw materials to industries and a market for manufactured goods. Although the majority (80%) of the nations agriculture is rainfed rather than irrigated, and as such may be thought of as vulnerable to climatic variability independently of water resources management, the security of irrigated high value crops and efforts to reduce the vulnerability of rainfed agriculture are both dependent on management of available water. Plantation farming of tea, coffee and trees, tourism and mining, each with their own significant water requirements are major contributors to the economy and add to Tanzania's economic dependence on the availability of water resources and its susceptibility to climatic variability.

Respondents gave testimony to this citing 'the huge impact' of rainfall variability on both rainfed and irrigated agriculture, and through reduced access to water as a result of low flows, depleted aquifers and failure of water supply schemes. The resultant delayed sowing, low or failed harvests, inadequate livestock fodder or grazing sites led to high cereal, vegetable and staple prices, and a crash in the livestock market. In turn this was said to result in reduced household incomes, food shortage, hunger, localised famine, migration and conflict. Social conflict resulting from water shortage can be very grave with regular incidences of fatal clashes between irrigators and pastoralists over access to limited water resources (Nkini, E., Principal Water Officer, pers. comm. 2006).

Further significant economic and social impacts of climatic variability cited by respondents included load shedding due to a reduction in hydro-electric power production (HEP provides 73% of the countries installed generating capacity**,** URT_2 2005); fisheries impacts; closure of industries; a disincentive to investors; and difficulties in sustaining the tourism sector which pulls in 17% of GDP.

Impacts were not quantified by respondents, perhaps due to a dearth of mechanisms for data collection and analysis. However a review of the national news media and information from other sources during the escalation of the 2005-06 drought indicates the scale of the economic and social implications of climate extremes and associated water availability:

Power generation

- Months of regular power shedding escalate with 12-hour power cuts in place across the country, in an attempt to conserve water behind Mtera Dam on the Rufiji (The Citizen, Wednesday 15th February 2006).
- The Mtera-Kidatu HEP facility providing nearly 50% of the country's needs could close at any time bringing the economy to its knees (The Guardian, 6th March 2006).
- The government subsidizes the Tanzanian Electric Supply Company (TANESCO) by over 30 billion TSh ($27 million) per month, (just under 20% of the countries monthly tax revenue) to buy electricity from private companies using emergency diesel generators (Daily News, 6th March 2006).

Food production, livestock and agriculture

- Vulnerable communities, the aged and HIV/AIDS patients in danger during the drought through

heightened disease risk and low nutrition (The Guardian, 4th February 2006).
- Food shortages in the worst effected regions as food prices spiral with rice and bean prices up by an unprecedented 25 - 50% (The Guardian, February 20th 2006).
- Drought ravages Maasai livestock with cattle prices plummeting to less than ten percent of the pre-drought price (The Guardian, 6th March 2006).
- Government spends $2.2 million in February to distribute 56 774 tonnes of relief food in 20 regions (The Guardian, 6th March 2006).

Water supply
- Dar es Salaam's population of over 3 million, faces the risk of supply failure should the drought continue (The Citizen, 28th January 2006).
- Longido families coping on less than 20 litres a day, sometimes walking more than 16 km in their search (The Guardian, 6th March 2006).

Tourism and wildlife
- Wildlife fatalities in Selous national park due to lack of water (The Guardian, 25th February 2006).

Other sources provide evidence of significant impacts:

Industrial sector and economy
- The country's second largest goldmine, Bulyanhulu, halted production in January due to lack of water. (Zonal Mining Engineer, Geita, pers. comm. 6th February 2006)
- Budget deficit of 2 % of GDP linked to drought (G Mgonja, Treasury, Daily News, 6th March 2006)

Health
- Recent research in Tanzania (Yanda et al. 2005) and elsewhere (Dercan and Hoddinott 2003), evidences causal linkages between drought and flood events and poor health, and of increased risk of cholera epidemics and upturns in malaria mortalities. The recent drought has been implicated in the initiation and spread of Dar es Salaam's cholera outbreak of 2005/06 affecting 42 residents (Kahumgisha, M., Chief Medical Officer, Dar Es Salaam City Council, pers. comm. 2006).

Given this bleak picture, a full economic impact assessment of climate extremes in Tanzania is worthy of urgent study. In its absence, what remains clear from the available data and testimonies gained is that although climate extremes may not have caused famine on the tragic scale seen elsewhere in Africa, the lack of available water resources brought by drought has very severe impacts and inevitably acts as a significant break on economic activity and development efforts.

Exposure to extreme climate events in Tanzania

Stand out flood or drought years as recollected by river basin professionals are shown in Table 1 and reveal a regular imposition of economic impacts and a toll on lives and livelihoods. Whilst the data are subject to the fallibilities of memory, a cyclical frequency of drought events over an approximately decadal period is particularly evident in the testimony given for the Rufiji, the Pangani and for the country as a whole with drought events cited for the years 1954-55, 63-64, 74-75-76-77, 84-85, 94-95-96-97, 2003 and 2005-06.

The existence of these cyclical events also features in the testimony of respondents when they were asked to describe changing trends in climatic extremes, with over half recognising cyclical changes in variability and a third suggesting that these were around a ten-year period. Such a cycle with its significant social and economic impacts has important ramifications for river basin management capacity, particularly in terms of drought preparedness. In order to appraise that capacity, a set of idealised attributes for dealing with climate extremes in river basin management are proposed. These are compared to the management responses to past exposures given in Table 1 together with additional indicators solicited through the questionnaire, interviews, a BWO annual report and within the provisions of the National Water Sector Development Strategy.

An idealised IRBM response to climate extremes

IRBM can be equated to the application of IWRM at regional scales, focusing on the critical needs of available quantities of clean water for human survival and sustainable development (Hooper 2005). Not only does IRBM face the classic problems of common pool resource management, but also, as Ostrom et al (2002) point out, many of the challenges may be exacerbated due to a reduced likelihood of co-operation in the face of uncertainty, such as that introduced by climate extremes.

To re-visit the Global Water Partnership (GWP) definition of IWRM, with an eye on the implications for management of climatic variability by river basin managers is useful:

"*a process which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems*" (GWP 2000).

It can be inferred that an idealised role would be for river basin managers to promote and coordinate the development and use of water in a way which minimises economic and social hardship, inequity and anthropogenic ecosystem degradation during extreme events. Within the toolbox available for river basin management this might best be done by anticipating the conflicts and impacts that might arise during extremes and attempting to mitigate them through dialogue with and sensitisation of water users, and by building in preparedness for extreme events into water user agreements and regulatory systems. The latter might take the form of staged reductions in levels of abstraction or strengths of wastewater discharged in the face of escalating drought conditions to protect priority uses or sensitive eco-systems. Where argued over and agreed in advance such arrangements have potential to smooth the impacts of extremes, particularly droughts, and to make water available for critical life support, ecological or economic uses pre-set by government policy or ideally, but perhaps more unlikely, by water user consensus. With, for example, such a drought plan in place the role of the basin manager would be to provide short term forecasts, monitor and then communicate the unfolding event (perhaps with threshold declarations of increasing drought severity), co-ordinate the introduction and if necessary, enforce the pre-arranged agreements. Such an approach would manage the expectations of water users and facilitate more realistic planning and preparedness for temporarily reduced or revoked allocations, thus enhancing resilience and reducing vulnerability.

A potential model of this ideal response lies in a comprehensive drought policy developed for South Africa (Abrams 2001), which comprises:

- Mitigation plans which seek to create conditions that will avoid water stress and drought.
- Monitoring and prediction systems, which should contribute to a broad early warning system.
- Development of drought management plans to be implemented during drought conditions including a clear unambiguous process of progressive declaration with pre-determined conditions, detailing; to what precise area the declaration applies; how it is made and communicated; who is responsible for determining the point of declaration; who is responsible for making the declaration, and what conditions, restrictions or activities will be imposed or required as a result; how compliance monitoring and enforcement will be achieved and by whom; what institutions will be involved; how different agents will communicate; what co-ordination and command structure will be established and maintained; what resources will be available; what procurement procedures will apply; and how field operation will be financed and controlled.

Recognizing the dangers of mapping institutional frameworks and responses out of context, this example is not proposed as a prescriptive model but as a regional benchmark to compare the organisational responses within Tanzania against. Those responses, given in Table 1 can be categorised into two typologies:

1. **Re-active emergency and rehabilitation response** concerned with a short-term emergency response to impacts of climate extremes often requiring large-scale mobilisation government or donor resources
2. **Planned pro-active event management response** is more long-term concerned with preventative planning, co-ordination and preparedness to mitigate and minimise impacts within the water basin

Whilst both are clearly key facets of a robust response to climatic extremes, our interest is primarily with the second. Pro-active event management can minimise death, economic hardship and costly reactive emergency interventions, falls within the realm of river basin management and is realistic, being reflected in drought response in many European states and the regional benchmark provided by Abrams. A review of Table 1 shows that aspects of our idealised pro-active response are reflected in the recollections of responses to past events. Analysis of these and supplementary information gathered allows us to consider the nature and efficacy of these in more detail and reflect on their adequacy.

The IRBM response to climate extremes in Tanzania

Legal and regulatory arrangements

An adjustment clause exists within the water use permitting system of Tanzania that allows the BWO to make temporary revisions under drought conditions. In addition, water use priorities are set by national policy which awards primacy to domestic needs, and these mechanisms in theory would enable BWOs to legally wind down less critical abstractions to make water available to life support or key economic water uses during drought. However, our research revealed that there are no agreed triggers for permit revisions, that revisions are re-active, triggered by ‘looking at water use’ and that, anyway, they had never been used. Furthermore, within water use permits, separate conditions are set for wet and dry season abstractions in an attempt to account for seasonal variation. According to earlier work by Sokile et al (2005), this sees a nominal 50% reduction in the water right during the dry season, but is unregulated, and additionally does not reflect the real proportional decreases found in dry season river flows which are closer to 10% of the wet season flows. So, the current legal and regulatory mechanisms leave a great deal of re-active work to be done by the BWO in seeking to co-ordinate an equitable and staged reduction in abstractions and it is unrealistic to expect water rights revisions or nominal 50% reductions to be effective in freeing up scarce water in this way during droughts. That the revision clause exists and that water use priorities have been ranked *does* present significant opportunities for pro-active drought agreements to be negotiated. According to our respondents however these tools have been idle, with “extremes not planned for”, “the sector lacking strategic direction in this respect" and "not enough staff to deal with the work involved."

Forecasting, monitoring and event communication

Conflicting responses were received relating to the presence and use of climate event forecasting. Some said that drought warnings were distributed by the Tanzania Meteorological Agency via the national media or that the government advised farmers, through MAFS once extreme event forecasts were received. Others mentioned international services and those of regional drought early warning services although cautioned that performance was erratic and unreliable. Still more responses suggested that an early warning system used to exist and that a sophisticated and good quality forecasting model was on the shelf at the MoW but had never been used because "the developers didn't co-ordinate with the end users". What is clear from these responses is that no one service, set of models or system was in use or agreed upon and that dissemination of available warnings to key sectors is in need of enhancement.

Strategic planning, co-ordination and policy

In terms of planning for extreme events, local basin scale initiatives were said to include stakeholder co-ordination, flood warning schemes, ongoing disaster management training and a drought warning system in the pipeline. At a national level, the suggestion was that these elements would be rolled out via the National Water Sector Development Strategy. Review of the NWSDS reveals government recognition that adequate water resources management would determine achievement of the countries economic growth and poverty reduction goals. Candidly, it goes on to highlight that despite reliance on HEP, the country's energy policy of 2003, developed by MEM, omits any mention of vulnerability to drought or drought contingency planning. The NWSDS goes on to plot out problem definition, goals and strategies within the water sector but confines discussion of climate extremes and their management to only two of thirteen subsequent sections. The first focuses on the development of alternative resources (rainwater harvesting, wastewater reuse, desalination and interbasin transfer) to supplement during times of scarcity. The second, relating to disaster management, recognises that in the past disaster mitigation was based on remedial not preventative measures, places future efforts around the provision of early warning systems, contingency planning and mitigation measures for minimising impacts. However, review of the NWSDS implementation plan (2005-15) reveals an absence of timetabled targets for such preventative management provisions, just a cursory target for two alternative resources to be researched and promoted by 2009.

Given the likelihood of climatic extremes every ten years and the gravity of the impacts it is perhaps surprising that coping with variability and managing risk are not more centrally placed within the strategy, or timetabled firmly into the implementation plan, and that hopes for improved drought resilience appear to be largely vested in locally untested supply side solutions. Furthermore, whilst mentioning the (some may say negligent) omission of contingency planning for drought by the energy sector is a progressive step, firm commitment to redressing this situation is conspicuous by its absence.

Data availability and analysis

These approaches described above - the use of regulatory tools, forecasting, communication and strategic planning - have the potential to be extremely data hungry. According to our respondents there are significant issues relating to the availability, quality, management, analysis, storage and availability of climate and water resource data and that this is related to poor network planning, a lack of trained personnel and equipment which in turn is attributed to the low priority and low levels of funding accorded the task of data collection by the government. An absence of data presents significant challenges to the river basin manager who has to make and regulate fair and sustainable water allocations, account for and plan to mitigate the impacts of climate variability, and ultimately undertake adaptive management of the resource based on measured outcomes of earlier decisions. Respondents ranked lack of data as a close third in constraints to effective management of climate extremes, behind lack of funds and lack of co-ordination, which of course contribute to the vacuum of data for resource management.

It is difficult at this point not to default to 'normative' IRBM assumptions: that good quality, extensive hydrometric datasets are critical for effective water resource management. However, as Lankford et al (2005) point out, adherence to this mantra is of limited immediate practical use to river basin managers in places like Tanzania. The extensive data banks afforded to many river basin mangers in the 'north' may be desirable, but their absence should not be used to harbor inaction or to attract priority financing over other perhaps more challenging and less politically comfortable activities of IRBM, such as regulatory compliance and enforcement. What's called for are novel, expedient, risk based approaches to monitoring and data to inform basin management. To relieve the burden of data collection the latter might incorporate proportional allocations, collective use permits, integration with customary arrangements, careful selection and use of management indicators and strategic monitoring sites, and enlistment of water users in monitoring. Data heavy solutions, sometimes problematic despite generous financing because of a need for many years of validated time-series hydrometric data, tend to ignore the immediacy of the basin manager's task, and so these approaches expounded by Lankford et al may be more consistent with the realities facing river basin managers in developing countries.

Constraints and opportunities for managing climate extremes and building IRBM capacity

The significant temporal and spatial variability and uncertainty in rainfall; the scale and inaccessibility of catchments; the limited livelihood options and low awareness conspiring against behaviour change and rapidly increasing demand across many disparate sectors, pose unique challenges for IRBM in sub-Saharan Africa and other tropical developing countries. Our ranking exercise of the most significant challenges facing effective river basin management, suggested that such difficult environmental and socio-economic contexts were pre-eminent in Tanzania. To compound this, these challenges are faced in an organisational environment of, in descending order of significance as testified to by the respondents; poor co-ordination and planning; low levels of awareness/participation of water users and stakeholders; a near vacuum of regulatory capacity with which to enforce water use agreements; a lack of funding, manpower and equipment; insufficient information and data; an inadequate framework for water allocation; and a lack of political will.

Despite this gloomy outlook, progress in managing water at the basin scale is ongoing and is evidenced by the efforts of the Basin Water Offices. It is argued that an institutional framework, legislative regime and competent Basin Water Officers with *potential* to manage water resources effectively are in place. For example, the Rufiji Basin Water Offices (RBWO) efforts in the formation of Water Users Association's (WUA's) and catchment committees, and the development of water efficient demonstration plots begin to provide the stakeholder and communication platform required for effective IRBM. Their regulatory compliance activities against illegal or over abstractions, where practiced, have released significant amounts of water for downstream use (RBWO 2006, Mswalo 2006). It should be noted that this work, apparently unpopular with some powerful elites, was ordered to cease during the 2005 election campaign.

In order to build on such achievement and overcome capacity constraints to improved management of climate extremes, the river basin management community gives its own suggestions. The responses are unlikely to make fresh reading for those familiar with the subject, grouping around the IRBM stable-mates of increased awareness, education, participation, data and enforcement, together with increased funding and planning, co-ordination and political will. These latter financial and political issues deserve special attention not only because they are accorded second and third place of importance by respondents (after education and awareness) but also because they appear fundamental to unlocking all those other constraints.

The RBWO is responsible for an area ¼ the size of Spain with a population of 5.4 million, many thousands of disparate water users, many of whom have no knowledge of the legal authority of the BWO or of principles of good water management, across 24 administrative districts where vested interests of the powerful in lucrative irrigation schemes conspire against change. It would be an achievement for the RBWO to effectively collect water user fees, co-ordinate hydrometric data collection, move towards integrated basin management, enforce agreements and plan for drought or flood mitigation in the manner of the South Africans even if they were funded at levels appropriate to the task. The reality is that in 2005-06 the RBWO received only $19, 000 from the MoW, 14% of its expenditure, the rest of which was made up from water user fees, royalties and contributions from donor aided projects. According to the RBWO annual report the office has only 4 professional staff of a required 16 and falls short of its compliment of total staff required to operate effectively by 108 (RBWO 2006).

The NWSDS recognises that poor performance in water resources management is linked to this minimal and declining budgetary allocation, amounting to only 3-5% of the MoW's budget. Plans to make up this shortfall seem destined to further skew staff time towards revenue collection activities and away from the task of water resource management, as recurrent cost shortfalls will be met by increased water user fees derived by the Basin Water Offices, with "supplementary funds coming from central government only where necessary" (NWSDS 2005). It is not difficult then to appreciate the roots of continuing capacity issues in dealing with climatic extremes despite reformed institutional frameworks and the availability of regulatory tools. That the accomplishments of the RBWO referred to earlier have been achieved only with outside financial support from the WWF and TANESCO underlines the implications of inadequate funding (Mswalo 2005). Effective capacity for managing climate extremes is unlikely to be cheap. But given the cost of failure to do so, the expenditure is likely to represent a good investment for the nation. A cost-benefit appraisal may reveal the financial imprudence of, as one senior MoW figure put it 'the short termism that prevents prioritisation and funding of drought planning *between* drought events'. Besides funding, political will is essential to provide BWOs with the authority to impose controls on freeloaders and carry out enforcement of water use permit conditions, and so is key in deterring unsustainable abstractions. As Ostrom points out, it is during extremes and uncertainty that non-compliance and the need for regulatory action is likely to be greatest, but multiple sources suggest that the authority of the BWOs is often undermined for political or financial convenience by those higher on the ladder of power. Indeed it was during the escalation of the drought that regulatory enforcement work, which was releasing significant illegally abstracted water for downstream uses that the BWO was told to hold off.

Funding shortfalls and political maneuverings resonate with the views of a number of respondents who suggested that the government 'lacked seriousness' and 'lacked commitment' in its efforts to deliver IRBM. With this in mind the more pertinent question moves from capacity building and funding to ensuring government accountability. Although the government cannot be expected to make rain or hold back floods, our research suggests that extreme climate events can be expected every ten years and that unregulated use of existing resources, catchment degradation and a lack of planning or preparedness exacerbates very significant impacts on the well-being of the population. The concurrent under-funding of an IRBM framework which, given sufficient resources could begin to address these issues, in this light, looks negligent. Given that direct budget support from donors accounts for a significant proportion of the government's total budget, the responsibility for any oversight in mobilising financial capacity for IRBM and preparedness for climate extremes doesn't just lie with the government, but with development partners and their consultant auditors. That capacity constraints and inadequate funding arrangements remain despite the extended engagement of donors demands that political barriers be identified and questions of capacity mobilisation be reframed as a priority. As a case in point, the six year $30 million RBMSIIP project projected an internal rate of return of 34% made up predominantly by increased revenue and reliability of HEP provision and yet front line water resource management work which might deliver these optimistic rates and which the project aimed to support are cripplingly under resourced.

These findings have significance beyond Tanzania where influential commentators (Biswas 2004, Mitchell 2004) are beginning to question the theory of IWRM, which they say, despite having been around for over thirty years has failed to deliver and is un-implementable. Our research suggests that it is not the theory that has failed, but perhaps those responsible for its proper financing and the rule of law.

The challenge for academia, support agencies, government and policy makers then is to identify, understand and remove these barriers to effective water resource management and to help prioritize and deliver capacity mobilisation efforts in support of the river basin staff in their seemingly Herculean task. Our research suggests that these efforts need to account for the challenging social and environmental conditions unique to developing countries, should focus on capabilities for the *practice* of the legal and institutional reforms made under IWRM and on improving government accountability. Research is ongoing in Tanzania by the authors, using a multiple case study approach to elucidate the contextual factors and enabling environment required for sustainable water management. By investigating the key attributes and competencies required by regulatory practitioners, we aim to build a concept of 'regulatory personality' which will help navigate the space between situated operational realities and normative policy specifications where real and positive change is possible. The research aims to contribute to the reframing of donor support and capacity building priorities in water resource management. Without such a reframing, given the evidence documented in this paper, Tanzania and places like it look set to suffer the lash of climatic extremes for some while longer.

References

Abrams, L., 2001, A drought policy for South Africa, the African Water Page. www.africanwaterpage.com

Biswas, A.K., 2004, Integrated Water Resources Management: A Reassessment. Water International, Volume 29, Number 2, Pages 248 – 256

Dercon, S., and Hoddinott, J., 2003, Health, Shocks and Poverty Persistence, Discussion Paper No. 2003/08, World Institute for Development Economics Research, UN University

Kahumgisha, M., 2006, Chief Medical Officer, Dar es Salaam City Council, Personal Communication, 21st January 2006

Lankford, B. and Mwaruvanda, W., 2005, A framework to integrate formal and informal water rights in river basin management, 'African Water Laws', 26-28 January 2005, South Africa

Lankford, B., Cour, J., Merrey, D.J., Hepworth, N., 2006 (submitted) From Integrated To Expedient: A Practical Framework For Water Resources Management In Developing Countries River Basins, Research Report, International Water Management Institute, Sri Lanka

Nkini, E., 2006, Principle Water Officer, Ministry of Water, Unit. Rep. of Tanzania, Personal Communication, 12th Jan 06

National Research Council, 2002, The Drama of the Commons, Ostrom, E., Dietz, T., Dolsak, D., Stern, S., Stovich, and Weber, E., Eds. Washington DC, National Academy Press

Mitchell, B, 2004. Comments on Water Forum contribution "Integrated Water resources Management: A Re-assessment" by AK Biswas, Water International, Volume 29

Mswalo, R, 2006, Ruaha Water Programme Coordinator, World Wide Fund for Nature, Tanzania, Pers.Comm., 16th Feb 06

Rufiji Basin Water Office, 2006, Progress Report July 2005 to April 2006, Ministry of Water, Tanzania

Sokile, C.S., Mwaruvanda, W., and van Koppen, B., 2005, Integrated Water Resource Management in Tanzania: interface between formal and informal institutions. 'African Water Laws', 26-28 January 2005, South Africa

United Republic of Tanzania (URT_1), 2005, National Water Sector Development Strategy, Ministry of Water and Livestock Development 2005-2015. February 2005

United Republic of Tanzania (URT_2), 2005, National Strategy for Growth and Reduction of Poverty, Vice President's Office. June 2005

World Bank, 1996, River Basin Management and Smallholder Irrigation Improvement Project, Staff Appraisal Report No. 151222-TA, World Bank, Tanzania

Yanda., P.Z., Kangalawe, R.Y.M. and Sigalla, R.J., 2005, Climatic and Socio-Economic Influences on Malaria and Cholera Risks in the Lake Victoria Region of Tanzania, Institute of Resource Assessment, University of Dar Es Salaam, AIACC Working Paper No 12.

Contact addresses

Nick Hepworth
PhD Researcher / Consultant
School of Development Studies
University of East Anglia
Norwich NR4 7TJ n.hepworth@uea.ac.uk

Table 1. Impacts and responses to stand out flood and drought events according to Tanzania's river basin management community

Years	Event type	Location	Impacts	Response
54/55	Drought	Rufiji	Hunger	
63/64	Drought	Rufiji / Pangani / National	Hunger; problems with HEP, irrigation and water supply	Government imported food
74/75/76/77	Drought	Rufiji / Pangani / National	Hunger; high cost to government for food imports. Low flows resulted in problems with HEP, irrigation and water supply	Government imported food; initiation of irrigation improvement projects – NGO Crash programme for buying and supply of seeds, rehabilitation of irrigation schemes, provided from strategic grain reserve to most effected areas - MAFS
81/82	Drought	Wami Ruvu	No harvest; high food costs; hunger;	
84/85	Drought	Rufiji / Pangani	Hunger; low flows resulted in problems with HEP, irrigation and water supply	Government imported food; initiation of irrigation improvement projects - NGO
94/95	Drought	Rufiji	Low flows resulted in problems with HEP, irrigation and water supply	
96/97	Drought	Wami-Ruvu; National	Crop failure nationwide, electricity rationing, industries closed, economic backwardness	MoW - alternative water sources provided for example boreholes drilled in Dar es Salaam. Government imported food from Zambia
97/98	Floods	Pangani / National	Flooding and crop failure	Evacuation, drainage restoration and relief - MAFS
98/99	Floods	Rufiji / National	Deaths through flooding of huge areas and drowning; destruction of infrastructure such as roads, bridges, buildings and electricity/water services; crop failure; low income; poor food security; landslides and paddies washed out; economic hardship	Government repaired damage and advised upland planting – MAFS. Gave advice to authorities on actions to take to reduce the impacts specifically death and physical damage- Rufiji BWO
2003	Drought	Gt Ruaha (Rufiji)	Most rainfed crops destroyed	We tried to educate and mobilise users to use water properly – Rufiji BWO
2005/06	Drought	Rufiji / National	Crop failure or no planting in many regions, power rationing, industries closed; problems with HEP, irrigation and water supply, hunger	Control and regulation of water use; issuing temporary revised water rights; sensitisation of water users on the effects of the event. Gave papers to authorities on actions to take to reduce the impacts specifically death and physical damage- Rufiji BWO