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**Evolving outcomes of water governance arrangements:  
Smallholder irrigation on the Usangu plains, Tanzania.**

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# **Evolving outcomes of water governance arrangements: Smallholder irrigation on the Usangu plains, Tanzania.**

**Tom Franks<sup>1</sup>, Frances Cleaver<sup>2</sup>, FaustinMaganga<sup>3</sup>, Kurt Hall<sup>4</sup>**

## **Abstract**

How does water governance change over time? What are the outcomes for smallholders and the ecosystems that support them? This paper reviews the development of water resources management over the past 40 years in the Kimani catchment of the Usangu plains, in SW Tanzania. The analysis is based on a conceptual framework for water governance comprising a system of resources, arrangements for access, and outcomes for people and ecosystems. We discuss how the resources for water governance have changed over time, we consider the changing arrangements for water allocation, particularly relating to water rights, water management organisations and physical infrastructure, and analyse the outcomes in terms of access to water for people and of maintenance of environmental flows. Development of water resources in Kimani has been successful on many counts, resulting in assured supplies for many users, with consequent improvements in livelihoods, including, in particular, increases in land-holding size. However, these improvements are accompanied by some negative outcomes, as they reduce water access for other users and threaten downstream flows. The experiences from Kimani highlight the need to map the whole institutional landscape and to ensure that physical infrastructure reflects institutional arrangements when designing interventions to enhance water security. Such interventions may well have significant outcomes for equity and power relations amongst water users.

## **Keywords**

water governance; water rights; water users' associations; water management; smallholders; livelihoods; ecosystem services; Usangu; Tanzania

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## **1. Introduction**

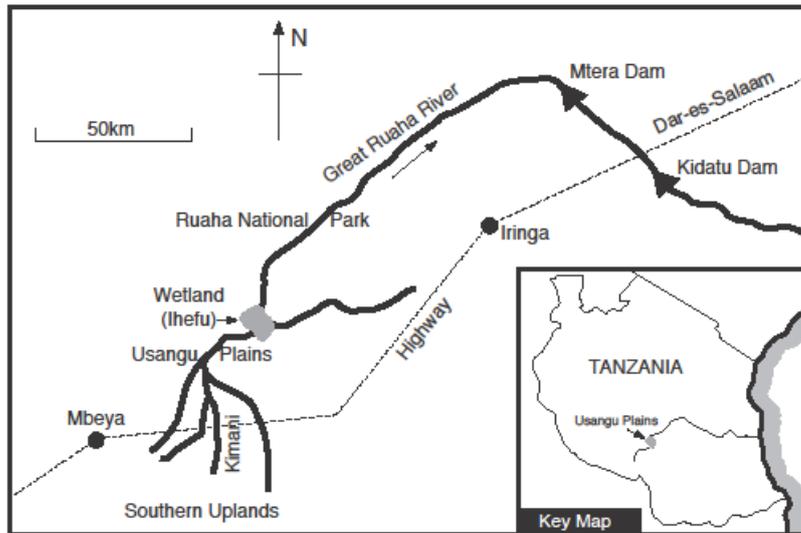
In this paper we discuss the evolution of water governance in the Usangu plains, SW Tanzania. Our aim is to analyse its outcomes, particularly for the livelihoods of rural smallholders, to understand how these change over time, and to draw implications for water resources from this understanding. We base our analysis on a framework for water governance comprising societal resources, arrangements for access and outcomes. This framework was developed following an initial period of work in Usangu around 2000 and we revisit the analysis with a further period of work in 2011. This, together with extensive documentation of other developments in the area over a 40-year period, provides an excellent longitudinal perspective on the key linkages of water resources and livelihoods in Usangu.

The paper begins by describing the geographical and historical context of Usangu. We then explain our conceptual framework for water governance, locating it within the current discourses on water resources development and river basin management. We go on to present a case study of the resources and arrangements for access in a specific sub-catchment of the Usangu plains, as a basis for analysing the outcomes of these arrangements, both for people and ecosystems. We conclude by drawing some lessons for policy and practice from our findings.

## **2. The Context**

The Usangu plains are located some 800km SW of Dar-es-Salaam, in the upper reaches of the Great Ruaha river, a tributary of the Rufiji (Figure 1). The plains lie at an altitude of around 1100m above mean sea level. Upstream and to the south of the basin is a range of uplands, from which a number of tributaries flow into the Usangu plains and thence to the Usangu wetland. Downstream of the wetland the Great Ruaha River flows through the Ruaha National Park and then feeds the linked Mtera-Kidatu hydroelectric system before joining the Rufiji. The Usangu wetland, known locally as the *Ihefu*, has been extensively discussed and described in the literature (SMUWC 2001, McCartney and Mahoo 2008).

Figure 1 The Great Ruaha and the Usangu Plains



Rainfall on the plains is around 600mm per year, with a pronounced dry season from May to November. The alluvial soils, coupled with intensive wet-season rainfall and supplementary irrigation from tributaries, makes the area very suitable for growing paddy rice in the wet season.

Water resources development in the Usangu plains can be traced through a clearly-identifiable sequence of phases and events, following a trajectory similar to those discussed by Komakech et al (2001) and Molle (2010). In the 1950s and 1960s large-scale resource studies were undertaken by FAO (and others), which defined the available resources in the whole Rufiji basin, and assessed their potential for development, both for irrigation and hydropower (FAO 1961, Hoag and Ohman 2008). These studies made the development case for the Kidatu (1978) and Mtera (1988) dams<sup>1</sup>. Although formal irrigation had been practised on a small scale in the basin since the 1940s, the 1970s saw the start of significant irrigation expansion, led by state-sponsored establishment of the Mbarali Rice Farm (3000 ha in 1973)<sup>2</sup>. The potential benefits of smallholder irrigation had been identified both by the FAO

<sup>1</sup> The biggest potential dam site identified by these studies (Stiegler's Gorge), was not developed, though it was continuously discussed. Indeed, a Memorandum of Understanding for its development was signed in 2012 between the Rufiji Basin Development Authority (RUBADA) and a Brazilian energy and construction company, Odebrecht.

<sup>2</sup> These were followed significantly later by state schemes at Kapunga (1992) and Madibira (1998), both also of around 3000ha

water resources studies and by Hazelwood and Livingstone (1978), who had specifically seen it as a response to population pressures, particularly from the mountainous regions to the south. Indeed, smallholder rice cultivation also developed significantly at this time, in parallel with the state farms, so that an estimated 30,000ha were under smallholder irrigation by the start of the 90s (Franks et al 2004).

As the available water resources became more intensively utilised, signs of basin closure became evident, particularly with the drying-up during the dry season of the previously perennial Great Ruaha river in the Ruaha National Park, a phenomenon first observed in 1993. This specific event, along with general drivers such as a focus on ‘irrigation efficiency’ (reducing losses through improved distribution and application) and on community management of resources following the 1992 Rio summit, led to a number of development projects, including the River Basin Management and Smallholder Irrigation Improvement Project (RMBSIIP, initiated in 1996 and funded by the World Bank), the Sustainable Management of the Usangu Wetland and its Catchment Project (SMUWC, 1998-2002, funded by DFID) and the WWF-implemented Ruaha Water Programme (commenced in 2003 and still on-going, with funding mainly from EC and DFID). Work carried out during the SMUWC project provides some of the data on which this paper is based. The more recent data arises out of a 2011 research study funded by the British Academy<sup>3</sup>. A focus on water resources in Usangu has continued into the first decade of the 21<sup>st</sup> century, with a notable event being the privatisation of two of the state farms, Mbarali and Kapunga<sup>4</sup>.

Drivers of change from outside the water sector have significant impacts on trajectories of basin development, as noted by Molle (2010), and Usangu is no exception. Perhaps the most important of these ‘external’ drivers of change have been population growth and movement. Quite apart from the generally increasing pressure on natural resources of all types arising from population growth and economic development, reference has already been made to the early recognition of the land and water potential in Usangu to feed a growing and migrating population. Hazelwood and Livingstone’s 1978 study identified migration from the south as

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<sup>3</sup>Understanding water governance in challenging environments: how institutions adapt to change.’ British Academy Grant. The data arising from this grant were collected primarily through a series of semi-structured interviews with key informants (including some also interviewed during the previous SMUWC study), as well as institutional mapping and observation. A study on water management practices at the start of the irrigation season was also carried out under the British Academy grant.

<sup>4</sup> The third, Madibira, is a smallholder co-operative farm.

the main issue, and large numbers of immigrants from this area have indeed settled in Usangu. However, the migration of Sukuma pastoralists from the north since the 1970s has had a more significant impact on the politics of development in Usangu. Pastoralism, which has been a major factor in the development of the basin through competition and conflict over resources, is extensively covered in the literature on Usangu (Charnley 1997, Malley et al 2009, Malley 2009).

### **3. Understanding water governance in Usangu**

In addition to population growth and economic development, the political economy of Tanzania, the nature of the state and the relationship between the state and its citizens have all had influence on the development of water resources. Issues such as these are commonly taken up in the literature on water governance. Debates on governance have academic, policy and sectoral dimensions. The academic literature tends to explore governance as comprised of dynamic processes, fuzzy institutions and shifting relationships of power with often uncertain outcomes. Governance is seen as polycentric, located in a variety of institutions involving negotiations between people of different interests (McGinnis 2011). Competition over the command of resources and claims to authority and legitimacy are emphasised on the one hand: on the other, 'real' governance is thought to also manifest in everyday practices, interactions and norms. Additionally there is a strong focus on non-formal as well as formal manifestations of governance, and on the way that the state or state-like authority impacts political practices and political identities at the local level and permeates even informal and everyday settings (Fisher 2008, Lange 2011, Poteete 2009, Ribot et al. 2006).

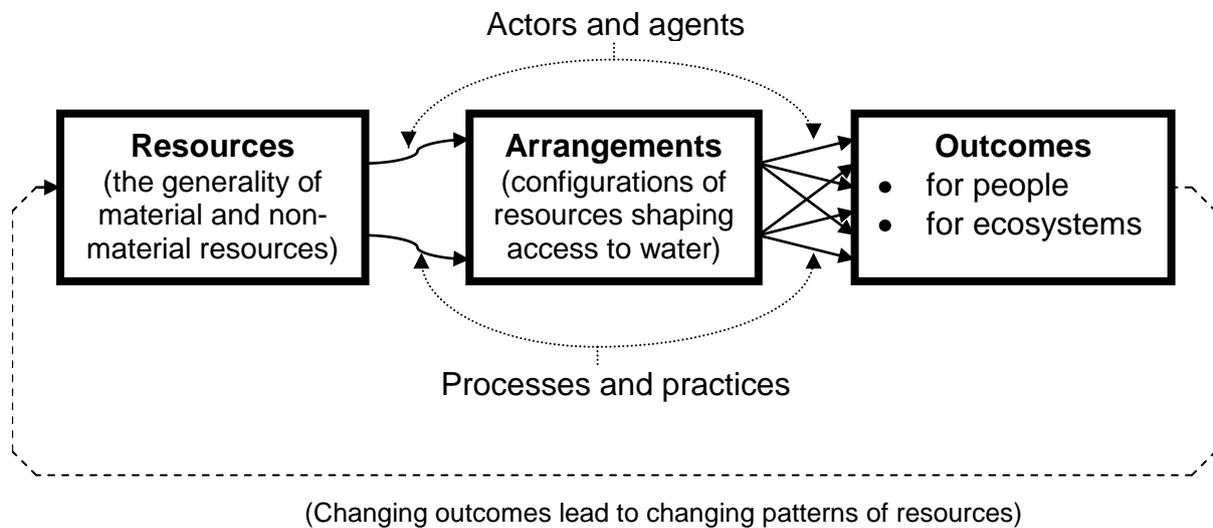
By contrast the policy literature concerned with governance tends to see 'good governance' as a normative project involving the promotion of robust institutions, transparent arrangements, and accountable service providers (Jaspers 2005). Indeed there are many different versions of the 'principles' of good governance and extensive discussion around them, both within the water sector and in development more generally (Grindle, 2007). Within the sector, water governance has been an important concept since around 2000 when it was taken up in the World Water Fora and other similar contexts, to an extent occupying the space formerly held by integrated water resource management and river basin management. Over the following years water governance has been extensively debated and

referenced (Rogers and Hall 2003, Lautz et al 2011). For example, writers such as Pahl-Wostl (2008) explore water governance at different scales and make the case for it at a global scale, while Lankford and Hepworth (2010) discuss governance in river basin management.

We see water governance as a fruitful way of moving beyond simplified and structured approaches such as integrated water resources management to a more nuanced understanding of how people interact with each other and with institutions such as the state in relation to water resources. This is particularly relevant in contexts like Usangu where the capability of the state institutions with responsibility for water governance is inevitably constrained by distance and lack of financial resources. Building on the seminal work by Rogers and Hall (2003), we define water governance as ‘the systems of actors, resources, arrangements and processes which mediate access to water by citizens and other stakeholders’.

Work in Usangu during the SMUWC period (1998-2003), and in particular detailed investigations and institutional interventions along the Kimani River, one of the sub-catchments in Usangu, led us to develop a detailed framework for understanding water governance (Franks and Cleaver, 2007). In our framework we see water governance as the availability of material and non-material resources in society, the arrangements for access to water which people draw from those resources, and the resulting outcomes both for people and for the ecosystem (figure 2). The links between resources, arrangements and outcomes are mediated by the agency of actors and by the processes and practices of everyday life. The framework is recursive, with changing and dissimilar outcomes for different groups of people over time leading to changing patterns of resource availability and arrangements for access.

Figure 2      A framework for water governance



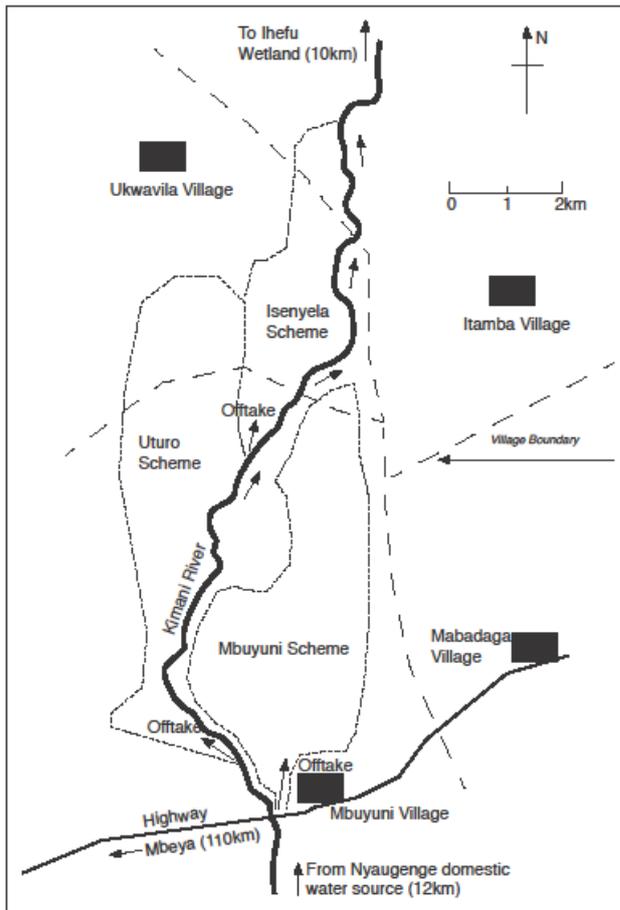
Within the overall geographic and historical context of the Usangu plains, the Kimani catchment provides an excellent location for detailed study of water governance at the local level. We use this framework to trace how certain patterns of resource availability and arrangements for access lead to evolving outcomes, both locally and in the plains more generally. We start by reviewing the key natural, social and institutional resources in the catchment.

#### 4. Resources for water governance in the Kimani catchment

The Kimani catchment is well endowed with land and water resources. The river rises in the uplands to the south, and flows down through the plains before joining the Great Ruaha, from whence it flows to the *Ihefu* (figure 3). The total catchment stretches some 45km south to north, and is around 14km at its widest point, covering a total area of around 600km<sup>2</sup>. As the Kimani enters the plain, it crosses the Dar-es-Salaam to Mbeya highway and the Tazara railway, which provide an important transport link from the catchment, both to the capital and the regional centre. The good soil and abundant wet season water in the catchment have formed the basis of irrigated agriculture over several decades. This started with the development in the 1980s of the farmer-led system at Isenyela, at the downstream end, where the topography was most favourable. From then on irrigation was an increasingly significant feature in Usangu, and further development took place in the catchment, firstly at the

upstream end where the Mbuyuni scheme was established with Canadian support early in the 90s, and then finally at Uturo in the middle reaches. As shown in figure 3, the catchment is now divided into three separate irrigation systems covering in total around 4300 acres. There is, in addition, an offtake for domestic water upstream of the irrigation outlets.

Figure 3 The Kimani Catchment



The majority of the population live in the middle reaches of the catchment, in villages and settlements spreading north from the highway. The total population is not known with any accuracy but was of the order of 8500 in 2001 (Richard, 2008). Early settlers in pre-colonial times were the Sangu, from whom the name *Usangu* was derived. However, Tanzania's recent history has given rise to large population movements so that the current population has a very diverse ethnic background. There has been steady in-migration from different tribes in the mountainous region to the south, as well as a significant influx of Sukuma pastoralists from the north of the country, who bring with them considerable wealth as well as different modes of agricultural production (Charnley, 1997). While cultural traditions still matter, and indeed are regularly used to frame debates in the political economy, people in the catchment draw on

a hybrid range of social and cultural practices, many of them originating from ‘outside’, to order their daily lives. In addition, both the constantly changing landscape (land degradation, inconsistent rainfall) as well as the internal and external ‘development’ influences (‘modern’ legal institutions, NGOs, etc.) shape culture and governance (Derman 200, Mosse 1997, Sehring, 2009).

The configuration of institutional resources form a major component of water governance systems in Kimani. State institutions have been important in the catchment, at least in principle, since colonial times. Indeed in the immediate post-colonial period they increased in importance with the extension of political organisation down to the sub-village level and below, as the state sought to reinforce its dominance by structurally controlling local institutions and development processes (Dill, 2010). Local community and civil society organisations are also an important feature in Usangu and indeed are taking on a more important developmental role there, as elsewhere.

Framing the institutional landscape is the policy and legislative framework which governs or regulates how these institutions operate. Of particular importance over the past two decades have been moves towards decentralisation, involving a constant reworking of relationships of responsibility between the centre and local areas<sup>5</sup>. At the same time policy emphasises individual land rights, supports small scale agricultural producers and encourages the linking of a variety of local community based management arrangements (such as water users’ associations) to state institutions. Numerous criticisms have emerged about the nature and logic of the decentralisation reforms and their implications for people’s access to resources (Fisher 2008, Ribot et al 2006, Lange 2011, Palloti 2008).

Support for community management was a feature of the 90s, following the 1992 Rio Summit, resulting, for example, in policies and acts designed to strengthen community involvement in land, forests and wildlife management. However, in recent years this seems to have been somewhat backgrounded, with an increasing focus now on the commercialisation and intensification of agriculture. This was articulated through the national policy of ‘Agriculture First’, with the involvement and support of agribusiness (for example, with the

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<sup>5</sup> Some commentators see ‘recentralisation’ as a simultaneous process. For example around 30% of Tanzania’s land is now state-owned or controlled in the form of National Parks or conservation areas (Brockington, 2008). Benjamin and Bryceson (2012) suggest the figure is at least 40% if one includes forest and wildlife areas controlled under the label of community-based conservation.

creation of the ‘Southern Agricultural Growth Corridor of Tanzania’ around 2011<sup>6</sup>) and often under the banner of the ‘green economy’ (Fairhead et al, 2012). Water resources, too, have been the subject of significant policy interventions (Lein and Tagseth, 2009), with key features being a focus on management of water resources at the basin level and the strengthening of the system of water rights and fees. These institutional resources, along with the social and physical resources in the catchment, have all shaped the way that water governance has evolved in the Kimani catchment.

## **5. Arrangements for access**

Local people in the catchment fashion specific arrangements for access to water (and other natural resources) from the range of material and non-material resources available to them. We look first at the institutional and legal (non-material) arrangements because these provide the overall context within which physical arrangements are made and practised, and from which physical access to water results.

The institutional landscape is rich and diverse, with a range of existing and newly-formed institutions available to manage or influence the allocation, protection and use of water. The structures of local government are firmly established in Tanzania, and the village government has long been the major state-related organisation ordering affairs at the village level. The Kimani catchment is composed of a number of village governments, from two districts, which results in an additional layer of complexity because of the different administrations involved. The main village governments are supported, firstly by lower-level hamlet committees and secondly by functional committees, the latter including, at least in theory, an environment committee with responsibility for the management of natural resources within the village area. Although it might be expected that the environment committee would take an active part in the ordering of water affairs in the village, this is not the situation now. Instead, the formal responsibility for allocating and managing water resides in a set of specific water institutions, comprising the Nyaugenge domestic water users, three water users’ associations for the irrigation systems of Mbuyuni, Uturo and Isenyela respectively,

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<sup>6</sup> See [www.sagcot.com/home/](http://www.sagcot.com/home/)

with the later addition of the Mapogoro pastoralists' association. These five institutions are co-ordinated through an apex catchment organisation called MAMREMA (a Swahili acronym)

These water institutions have taken their present form over the past 15 years or so. The first to be established with its present constitution was the domestic water users' association in 1999, following the aid-funded construction of the offtake and distribution system. The irrigation water users' associations succeeded somewhat informal management arrangements, particularly at the downstream Isenyela system which was farmer-established and developed. This process was initiated in part by the promulgation of the 1992 Revision to the Water Act, with its emphasis on the importance of water users' associations. It was further supported through the intervention of aid programmes, particularly SMUWC which gave financial assistance during the early years of the formal establishment of the water users association, and was specifically responsible for the setting up of MAMREMA. All of these organisations are now firmly established, having written constitutions, and having gone through several rounds of elections. Their relationship with village governments also seems well established, with, for example, informal sharing of office space and facilities.

Along with the state-sponsored institutions of local government and water users exists a range of civil society institutions which also have an influence on the way local people order their lives, including their access to water. Chief among these in the area are faith-based organisations such as the churches, and related groups such as choirs. Others include women's groups of various types and a self-defence society of the pastoralists. We found a good example of the importance attached to the role of these groups during a drought in the 2010-11 wet season, when the village government facilitated all the churches and mosques to come together for a day of prayer for rain and paid for traditional leaders to undertake rain-making ceremonies.

There is therefore a wide range of interlocking organisational arrangements that local people make in order to access water. These are structured within the formal bureaucracy of local government and reside in principle in the various water users' associations and the catchment apex body, MAMREMA. Our studies show, however, that the actual organisational arrangements are much more complex than this, and that people also call on a wider range of local and social organisations to assist them in these processes when it seems necessary. The

result is a form of polycentric governance which is much observed and discussed in the literature (Sokoile et al 2005, Neef 2009, Lankford and Hepworth 2010, Pahl-Wostl 2011).

Another finding from our recent studies is that the influence of specific organisations on the actual practice of water allocation and management is relatively limited, even for those organisations for which it is the main responsibility, such as the water users' associations. We found that the actual locus of power resides in a network of powerful individuals<sup>7</sup>, rather than the formal water user organisations. Literature on 'real' and 'hybrid governance suggests that there is no single location of power. Power is not exclusively vested in the state, or state-line institutions. Rather the location of power may be plural and be located in shifting alliances or configurations of actors (Clever, 2012).

Representatives of these powerful networks are in key positions in all the significant organisations. Whilst the form of structured and democratic decision-making is retained, actual decisions tend to be made outside of these formal settings. For example, the constitutions of the water users' associations require twice-yearly meetings, at the beginning and end of every season. Although the pre-season meeting would appear to be the most appropriate forum in which to determine allocation and management procedures for the coming season, we could find no evidence that any of these meetings actually took place in the year 2011, leading to the conclusion that these water decisions are actually being determined in different non-formal settings. The complexity of evolving organisations and the practice of power within these organisations amply demonstrate the difficulties of designing institutions for water governance and initiating and supporting them through external interventions, difficulties we have discussed before in relation to Usangu (Clever and Franks, 2005) and which have been discussed by others elsewhere (Huppert 2008, Poteete and Welch 2004).

Beside organisational arrangements, stakeholders in the catchment also make legal arrangements to shape access to water. Two aspects of these legal arrangements are of particular importance. Firstly the state has put in place procedures to codify the legal rights and obligations of water users under the revised Water Act. The Kimani catchment lies

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<sup>7</sup> In a workshop conducted in 2012 by WWF in Usangu, various stakeholder groups, including local and district government officials, identified interference by politicians as a major problem. (Mike Morris, pers. comm.)

within the Rufiji Basin<sup>8</sup>, and is therefore subject to the jurisdiction of the Rufiji Basin Water Office (RBWO). The head office of the RBWO is at some distance from Usangu but, in view of the importance of the basin, a sub-office has been set up within it, to strengthen attempts to identify water users, issue abstraction rights and impose annual fees for these rights. By 2010 this system was in place, with all the water users' associations in the catchment being registered and receiving a specified right for wet season abstraction. In return the water associations are paying a single fee for this right, the fee being in turn collected by the association through fees from individual farmers. Whilst the system is by no means perfect, many farmers are paying, and thus tacitly accepting the legitimacy of water rights and fees, though there are numerous complaints of the level of the fees and the returns or benefits that they are seeing from them<sup>9</sup> (Rajabu and Mahoo 2005, Speelman et al 2011). It should be noted that the farmers' fees cover more than just the fee for the water right, funding also some routine maintenance and the costs of the associations. Thus farmers are by this time accustomed to the idea of communal financial arrangements to support access to water through the associations. For RBWO, the fees for water rights cover only part of its operational costs, the remainder having to come from state and other (aid-funded) sources. RBWO uses its operational budget to support activities related to water allocation and management throughout the basin. For example it has funded regular meetings of a water managers' group in Usangu, bringing together the key officers with responsibility for actual water control structures, to provide a forum where they can discuss related issues and understand the wider context of water resources in the basin. Whilst this is a useful initiative, the RBWO is insufficiently resourced, both in staff and financial terms, to regulate and monitor day-to-day water management practices to the extent needed.

A second important component of the legal arrangements for accessing water lies in the judicial systems for resolving conflicts, including between water users. Here we see parallel systems in operation. There is, firstly, the customary system, based primarily on a council of elders with respect and standing in the community which adjudicates on conflicts from the perspective of custom and tradition. These customary laws have been extensively investigated by Maganga (2003, 2004) in Usangu, and their importance here and elsewhere is

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<sup>8</sup>One of nine river basins into which Tanzania has been divided, under the 1992 revision of the Water Act.

<sup>9</sup> It is also reported that many of the farmers who do pay are not 'indigenous' to the area. They may be using payment as a mechanism to confirm their access to land.

generally acknowledged (Kemerink et al 2009, van Koppen et al 2004, Sokile et al 2005). Alongside the customary tribunals lies the formal system of primary courts, operating at the ward, district and national level. During our recent studies we found several examples of water conflicts for which resolution was sought through these different systems, the actual process being followed depending on the interests of the protagonists and the prevailing social norms. It appears that the traditional courts are often used to adjudicate on anti-social or 'bad' behaviour, whilst the formal courts are used for crimes such as theft, or violence.

It is essential to note also that the complex and layered legal processes have created a range of avenues through which people settle disputes and this in turn shifts the balance of power between customary and modern legal institutions. Water users actively deploy "forum shopping" to utilize the various fora which legitimize their claims and serve their interests (Kemerink et al, 2009). However, legal pluralism does not necessarily translate into fair and equitable resolution to conflicts over water and other resources. On the one hand, customary law frequently reflects unequal power relationships in local communities. On the other hand, it is maintained that marginalised groups such as women and the poor often lose out in formal legal processes (e.g. land titling programs) as they tend to lack the resources (knowledge, time, travel, and money) required to be successful through state mechanisms (Meinzen-Dick and Nkonya, 2005).

Physical infrastructure makes an important contribution to arrangements for access to water by stakeholders in Kimani. Given the favourable conditions in Usangu, there has been a long tradition of irrigation, based originally on farmer-constructed systems with earth offtakes and canals. In recent times there have been a range of measures to improve these systems, primarily through the provision of concrete structures and lined canals. This has resulted from the pressures in agricultural water use to increase efficiency<sup>10</sup> so as to reduce water use and to increase the precision of application, with the aim of increasing 'crop per drop' (Boelens and Vos, 2012). The response in Tanzania to these drivers was found initially in the River Basin Management and Smallholder Irrigation Improvement Project (RBMSIIP). As its name implies, RBMSIIP was intended to support both the ongoing development of river basin management in Tanzania through such organisations as the RBWO, and to improve smallholder irrigation through 'modern' physical infrastructure. Although RBMSIIP is now

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<sup>10</sup> Efficiency in agricultural water use is nevertheless a contested concept (Perry, 2007). This is further discussed in several of the papers in volume 108 of the journal *Agricultural Water Management*.

completed, the process of irrigation improvements continues through other funding mechanisms. In the case of Kimani, the domestic water supply system and the head end irrigation system of Mbuyuni both had concrete offtakes constructed by the end of the 90s. A concrete offtake for the next downstream system, Uturo, was completed in 2008, with external funding. An interesting feature of this structure is that it in no way reflects the system of rights established by the RBWO, nor does it take account of the need for environmental flows to the wetland. Uturo has a nominal right for a flow of  $1 \text{ m}^3/\text{s}$  to feed an area of 500 ha, whilst the Isenyela system downstream has a right of  $1.5 \text{ m}^3/\text{s}$  to feed an area of 700 ha. In spite of this, the gates to the Uturo canal are twice the size of the gates for the downstream flow, indicating that, in practice, actual abstractions bear no resemblance to the nominal rights. This situation appears to have come about at least partly because of separate institutional responsibility and lack of co-ordination, since responsibility for design and construction of structures lies with the Irrigation Zonal Office in Mbeya, which is physically far distant from the RBWO and institutionally separate. It may also be that the Uturo water users association (which is in fact legally a co-operative, unlike the other two irrigation user associations in Kimani) was able to exert some influence in the final layout of the Uturo structure, though we found no direct evidence of this. Whatever the ins and outs of this particular situation, it demonstrates the importance of the physical arrangements for access, and the need for them to reflect and support the institutional and legal arrangements.

## **6. Outcomes**

The changing patterns of resource endowments and evolution of arrangements for access over the past 30 years lead to range of diverse outcomes. We look first at the primary stakeholders in the catchment, and what it means for their livelihoods. Results for our 2011 studies, backed by earlier similar studies (for example, WWF 2007) indicate that rice farming is a profitable enterprise, even for smallholders and certainly for those with larger holdings. Our findings are presented in table 1.

Table 1      Net cash income from rice farming

Type	Farm size	Net cash income per farm per annum
Small-holder	Up to 2 acres	A few hundred thousand T.Shillings (a few hundred dollars)
Medium –scale	From 2 to 10 acres	A few million T.Shillings (several hundred dollars)
Large-scale	From 10 to 50 acres	Several million T.shillings (A few thousand dollars)
Very large-scale	More than 50 acres	Many million T.Shillings ( Many thousands of dollars)

In this table we define a smallholder as someone owning 2 acres or less. It can be seen that smallholders can reasonably expect a cash income of a few hundred dollars per year. In general smallholders will pursue a number of different livelihood strategies in order to diversify and spread risk (Smith 2004). In Usangu many of them will grow rainfed crops and indeed also own cattle, in spite of the general antipathy to pastoralists locally and in Tanzania more generally. Non-agricultural enterprises by household members also form part of livelihood support. Income from rice production is thus generally only part of household income but it can make an important contribution, particularly through making cash available for additional expenditure such as school fees. Once holding sizes increase to the medium or large size, the income from rice farming becomes very significant. Farmers with very large holdings, above 50 acres, are very rich indeed, with commensurate power and influence.

A very significant finding emerging from the research carried out in 2011 was the distribution of landholding sizes in the Kimani systems. These are presented in table 2.

Table 2 Irrigated landholding sizes in Kimani

Scheme	No off holdings	Total Area	Average Holding	Small-scale	Medium-Scale	Large-Scale	V large
		Acres	acres	No.	No.	No.	No.
All	1310	4373	3.3	773	466	68	2
Mbuyuni	939	2576	2.8	634	267	37	0
Uturo	103	731	7.1	17	68	18	0
Isenyela	268	1066	4.0	122	131	13	2

These show that, although the majority of holdings served by the systems are smallholdings, a significant minority are medium and large holdings. In addition, there are two very large-scale farmers, even though these are small systems overall. In the 90s the Kimani systems were described as ‘smallholder’ systems, with the typical smallholder owning around 2 acres. The recent data indicates that this general picture might be changing. Further evidence of this is provided by the possibility of comparing landholding sizes in 2000 and in 2008-10 for a cohort of named individuals for whom records were available over this period. This data showed that, for these 43 individuals, 30 had increased their holding sizes (in one case by 43 acres), 4 had the same holding at the later date, and 9 had a smaller holding<sup>11</sup>. Unfortunately the data did not allow us to trace individuals who owned irrigated land in 2000 but did not do so a decade later, as this would help to explain the mechanism by which holding sizes are changing. Anecdotal evidence also indicates that, in Usangu generally, rice farming is being practised by a new group of the middle class, represented in particular by local government officials, many of whom have taken up the opportunities for broadening their livelihood base through renting land from the new owners of the recently-privatised estates in the catchments adjacent to Kimani. Analogous relationships and outcomes have been documented by Hope et al (2008) on the Khumbe scheme in South Africa. Hope’s analysis confirms the benefits of secure access to irrigation by smallholders, with related loss of benefits to other water users, though it is noticeable that in the South African case there appears to have been relatively little reallocation of land. Similarly Namara et al (2010) has explored in some detail the linkages between agricultural water management and poverty reduction through changes in access to water.

In relation to livelihood outcomes, mention should also be made of the outcomes for pastoralists. This is a complex story which is told in detail elsewhere (Walsh, 2012). For the purposes of analysing water governance in Usangu it is sufficient to note that pastoralists are subject to local and national pressures which combine to cause difficulties, including, at the practical level, access to water and pasture. Many pastoralists have been evicted from Usangu and many of those remaining have taken up different or additional livelihood strategies such as rainfed farming. In general it can be said that the development of the rice economy in Usangu is matched by a decline in the pastoral economy.

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<sup>11</sup> ‘Holdings’ refer to owned land, as recorded in the associations’ registers.

In addition to outcomes on livelihoods, water governance in the catchment has important outcomes for the representation and voice of local stakeholders. We have discussed above how the institutional arrangements come to be dominated by an elite group of stakeholders, who are well known to one another and often related. We found many examples of this during our field work. For example, in 2011 the chair of the apex organisation MAMREMA was the son-in-law of the chair of the Mbuyuni water users' association, and was also a local government executive officer, albeit in a different area. Through these relationships and positions these officers are able to influence deliberations and decisions relating to water allocation. This happens in spite of regulations to try to constrain it. Officers of the water users' associations are ineligible to hold village government positions locally in order that, as it was put to us, *'they are not able to be accountable to themselves'*, yet we were also told repeatedly that this did not prevent the networks operating to their own advantage. These individuals are also very significant in relationships between the irrigation systems and external interests and stakeholders. Whenever there are visits from consultants or researchers with a study interest in Kimani, it tends to be always the same relatively few powerful and well-connected individuals who provide the interviews and the data. Hearing the views of the less powerful is less straight-forward and speaking to the 'dispossessed' (the landless or those without connections to the powerful) is very difficult indeed. This is partly because it is difficult to identify them and partly because they lack the time and resources to be involved in such discussions. Even when they attend they are constrained by socio-political pressures from speaking out.

Our respondents often refer to the powerful individuals who belong to the dominant networks as the 'favoured 500'. This is apparently in reference to the fact that many of them live within 500 metres of the headworks. One would indeed expect to find power and influence related to physical position on the system. Over many years it has been clear that close access to offtakes allows farmers to be relatively successful, because they have more assured access to water. Very quickly they then utilise the outcomes of their relative success (greater productivity, leading to higher incomes) to maintain and enhance their access to water through other means (financial and institutional arrangements, as we see here). This example neatly illustrates key linkages within our water governance framework (discussed previously), as they play out in the local context. It is, however, worthy of note that in the Kimani systems, proximity to the offtakes is not the only determinant of power and influence. In Kimani the two largest holdings (83 and 50m acres respectively) are held by farmers in the

downstream system, Isenyela. Their financial wealth, as can be seen from table 1, is considerable and this is allied to extensive family networks which gives them access to important resources such as labour. They also rent out many of their downstream plots, which increases their social and economic power. This makes them very dominant in the workings of the Isenyela water users association and of the catchment as a whole, but they are by no means head-enders. It is likely that this situation has lasted since the founding of Isenyela in the mid 80s, with these two individuals being able to build up their position gradually over time. In Kimani being a 'head-ender' is not only a locational concept.

While this discussion has so far focussed mainly on representation and voice within the system and in the water users associations, it should be noted that water governance and increased access to water (for some users) also has outcomes for representation and voice to external agencies and stakeholders. In the developing scenario of river basin management in Tanzania, the water users' associations can present their positions and interests more effectively to bodies such as the Rufiji Basin Water Office because of the security provided to them by the wealth that they generate from irrigated agriculture. This has many positive outcomes but also perhaps negative outcomes for other users, particularly those downstream or those with a weaker or non-existent voice to speak for themselves. There may also be negative outcomes for the ecosystem, for example when influential farmers push for dry season irrigation.

Outcomes for the ecosystems in Usangu are closely linked to outcomes for people. Indeed, the relationship is undoubtedly circular. Reduction in access to land and water induced by changes in the environment threaten human security through increased insecurity of livelihood production activities and through an increase in conflict over ever reducing resources (Malley et al 2008, Malley, 2009). We have explained the important contribution that catchments like Kimani make to flows through the wetland and to the Great Ruaha river downstream. The ecosystem services provide by wetland systems have been understood for some time<sup>12</sup> but in Usangu have received increased study since the drying of the river downstream first in 1993. They include downstream flows for hydroelectric generation (Kadigi et al 2008), directly-productive services such as grazing and fishing, environmental services to wildlife (the wetland is a bird habitat of internationally recognised importance) as

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<sup>12</sup> Gordon et al (2010) discuss the trade-offs between water for agriculture and other ecosystem services

well as services of cultural significance to local people, such as support to pastoralism as a way of life. These of course change over time, and indeed have been drastically altered since the turn of the millennium with the gazettement of the wetland as an extension of the Ruaha National Park (Walsh, 2012). This prevents by law human activities within its boundaries except those expressly permitted by the park authorities, providing another good example of how legal instruments can be utilised to support, or in this case constrain, arrangements for access to water. Whilst the fate of the pastoralists excluded from the wetland has remained a matter of national interest, the small but active fishing community who used to make their livelihoods from fishing on the wetland has been completely lost to public view. Even the very minor canal-bank fishing carried out in Kimani is now actively discouraged by local farmers and the water users' associations.

The contribution of flows in the Kimani and the other catchments to the status of the wetland has been extensively studied, along with the focus on the wetland ecosystem services. Studies during the SMUWC period (1998-2002) and a subsequent study under the WWF programme (2010) have confirmed the importance of these river flows, particularly during the end of the dry season, when flows are minimal and rainfall is very low<sup>13</sup>. The WWF study made an estimate of the environmental flows required to maintain the health of the wetland, although it stopped short of defining a minimum dry season flow in specific tributaries. Nevertheless it is clear that the Kimani has a contribution to make and therefore the residual flows are of importance, particularly during the dry season. Unfortunately there are no data available on downstream flows in the individual catchments, though there is a gauging programme at the confluence of the tributaries in the Great Ruaha before it enters the wetland. These data are inconclusive. Whilst they show that some dry season flows are continuing, they are not sufficient to reveal any long-term trends in the total volume of water flowing into the wetland during the dry season. Anecdotal evidence and informal observations downstream in the park indicate that the periods of no flow at that point are increasing year by year<sup>14</sup> but hydrometric data to support these observations are not available. One can surmise that consumption upstream is increasing, as the irrigation systems become more established and the power and influence of the irrigators becomes entrenched. For the time being, however, it seems

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<sup>13</sup> Until recently it has been assumed that wet season rainfall and flows are sufficient to supply the likely feasible maximum irrigated area and leave enough for the wetland downstream. This, however, is now being questioned.

<sup>14</sup> This evidence can be viewed at [www.SueStollberger.com](http://www.SueStollberger.com)

unlikely that dry season abstraction for irrigation will be a major factor, in spite of general encouragement for it by government (under the Agriculture First policy) because the available water is very limited, and abstraction will be difficult and costly. Some high value crops such as vegetables will continue to be grown on river banks during the dry season, as they are at present, but this is not likely to become a large-scale operation.

## **7. Conclusions**

Analysis of water governance in the Kimani catchment over the past thirty years or so provides some interesting lessons and conclusions on the linkages of water resources to rural development. Kimani is a small catchment within a relatively small basin in a particular social and physical context, so one must be cautious of making generalisations. Nevertheless, for this case study we have been able to review the resources and arrangements for access to water over a long period, to have detailed longitudinal data for a specific group of stakeholders, and to offer reasonable explanations of the resulting outcomes. We summarise here our main findings in relation to institutional resources, physical resources and livelihoods.

Our work in Kimani confirms the complexity of institutional arrangements for access to water, and provides insights into the way these institutions actually work in practice. Whilst the responsibility for water governance very often lies with specific institutions, such as water users' associations, it is important to be aware that other institutions will also have an influence on arrangements for access (Potkanski and Adams, 1998). Therefore it is necessary to attempt to map fully the institutional landscape before any interventions or support are planned, and to try to understand in advance the likely interactions between the different institutions. What is the role of the state and of state institutions at the local level? How important are the institutions of civil society, such as faith groups or citizens' organisations? In our earlier work we analysed the water institutions in the catchment from the perspective of the institutional design principles first put forward by Ostrom<sup>15</sup> (1992), suggesting that, in practice, institutions elude design. Development of water resources requires development of

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<sup>15</sup>Ostrom over the past decade gradually refined her approach, reducing the emphasis on design principles and referring instead to design questions (Ostrom 2005, 2008)

the institutions involved, which in turn inevitably requires some degree of institutional design and configuration. The constraints to this process and the unexpected consequences of the dynamic evolution of institutions must be recognised. The shifting institutional landscape is a challenge.

Besides the complexity and polycentrism of institutional arrangements, we found also that, in the relatively small arena of the catchment, a network of powerful and well-connected people become dominant, building on the resource base which is afforded to them through their preferential access to water in the early stages of development. In order to get as wide an understanding as possible of the system of water governance, and to take the best possible decisions about future directions and actions, it is important to ensure that the voices of the less powerful and of the powerless are heard. This is a difficult process, since it is often not easy to identify people who are usually excluded in a community context, and to create spaces for participation so as to access their opinions (Cornwall, 2002). Furthermore, it may be easy to ignore those contributions where they contradict mainstream thinking. This may be a particular issue in irrigation, because 'modern' approaches to irrigation delivery may crowd out traditional methods of water management which have evolved over time, driven by both social and technical contexts (Lankford, 2009). However, it is essential if privileged access to water is not to become further entrenched, with potential consequences for other water users. These conclusions are by no means peculiar to the Tanzanian context and similar dynamics are discussed by Mapedza and Geheb (2010) in relation to Zimbabwe.

Important lessons for physical resources and arrangements can also be derived from the work in Usangu. It is, first, necessary to deepen and broaden the knowledge base as far as possible among all stakeholders. The relationships between the various components of a water resource system such as Usangu are complex, and understanding them is made more difficult by issues of scale. 'Upstream' (an irrigation offtake) may be so far away and so different from 'downstream' (a hydro-electric system) that many stakeholders are not easily able to comprehend the relationships. All opportunities should be made therefore to expand and increase the knowledge base amongst stakeholders. The water managers' group in Usangu is an example of one possible approach, providing a forum where water relationships can be discussed and explored without the need for outputs and transactions. Wider stakeholder forums have been regularly used in Usangu to spread knowledge of water resources, with the useful outcome that water knowledge is not confined to specialists and experts. WWF has

continued this practice throughout its support activities on the Great Ruaha, with an on-going programme of workshops comprising a wide range of stakeholders (WWF, 2012).

A very significant aspect of the evolution of water governance in Kimani is the way that the provision of physical infrastructure has reinforced particular arrangements for access. This process has been going on for some time, with the improvements made to headworks under the RBMSIIP project. These reveal the importance of ensuring that the layout and size of the infrastructure reflect the theoretical water allocation arrangements. The Kimani catchment has a well-established system of water rights in place, so that the relative abstractions of the three irrigation systems is known, but the newly-constructed Uturoheadworks take no account of these relative abstraction rights. Making the abstractions at this point reflect the relative rights (and fees paid) of the different systems requires a subtle and complex individual operation of the three gates, quite beyond the technical and human resources of the local gate operators. A simple proportional structure would have made this a very straight-forward operation. The general point here is that water governance, the allocation and distribution of water between different users, is a socio-technical system, and it is important to understand fully the contribution of the physical (technical) infrastructure to that system (Lankford and Mwaruvanda, 2007).

Perhaps the most important finding arises from the analysis in Kimani of the distribution of landholding sizes on the systems. Although originally set up to support 'smallholders' (2 acres), a significant number of the holdings are now medium-sized, and there are some large and very large holdings. The available evidence also shows some landowners (or renters) increasing their holdings significantly over the last decade. Whether this occurs through expansion into previously unirrigated land (unlikely, as the supply of such land is limited) or aggregation by buying or renting plots from others and thereby dispossessing them, the outcome is clear. As some farmers prosper from season to season through initially-favourable arrangements for access, they use their improved livelihoods and resource base to secure these arrangements, and as a platform to expand further. Systems of water governance inevitably have outcomes for relationships of power and equity amongst water users, as well as direct outcomes on livelihoods. Policies for regulating and supporting water governance must take account of this and be drawn up in recognition of the range of possible outcomes.

In summary we can conclude that water governance results from the interplay between a range of macro- and micro- level factors. We have tried to capture these linkages through our governance framework of resources, arrangements for access, and outcomes, and we have used the framework to analyse the evolution of water governance over time in Kimani. This analysis highlights the need to understand that polycentric governance will have diverse and sometimes unpredictable outcomes, delivering assured access to water for some and water insecurity for others, with consequent implications for equity and shifting locations of power. An essential starting point for supporting rural development through water resources is understanding the physical and material resource base, the arrangements for access and the social and political processes of water governance.

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