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## **Integrated Water Resource Management in Tanzania: interface between formal and informal institutions**

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*Formal and informal institutions are closely linked and greatly depend on each other. As in other countries, Tanzania recently engaged in a far-reaching formal institutional reform towards Integrated Water Resources Management. This paper focuses on the interfaces and linkages between formal and informal institutional frameworks for water management in Tanzania with a case study of the Mkoji sub catchment in the Rufiji Basin. The paper identifies four major areas of interfaces, namely; centralized and local institutions; modern water rights and customary rights; Water User Associations and informal associations of water users; and formal and informal power relations. The paper argues that although there are some positive linkages between formal and informal institutions, there are also struggles and bickering between the two. The paper highlights the complexity of institutional interfacing. Finally the paper identifies potential ways in which the ongoing reform should consider customary arrangements and provide a better framework for sound management of water.*

*Keywords: Institutions, irrigation, water right, Tanzania*

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### **Introduction**

During the past two decades, most Sub Saharan countries have embarked on comprehensive reforms towards Integrated Water Resource Management (IWRM). Most emphasis has been on institutions. Water management policies, legislations and legal frameworks, and organizational setups have been reviewed and redesigned. In almost all countries, River Basin Management approaches have been adopted. IWRM refers to amalgamation of all use sectors, all stakeholders, all prefectures, all tiers and all institutional constituents, both formal and informal, to make a viable and sustainable management system.

The legal and regulatory framework of water management in Tanzania is a mix of written Ordinances that were made by the Legislative Council before independence and the contemporary legislations in one hand, and the set of local, community based practices that are normally determined by local customs, traditions and culture of the water users (Sokile et al. 2003, Maganga et al, 2002, Sokile & van Koppen, 2004). At the national level, water management is predominantly governed by formal institutions, mainly policies, acts and legislations, and related organizations that are judiciously established in accordance with the formal provisions. Yet, legislation is potentially an important instrument to consider informal arrangements. At the basin level, there is a mix of formal and informal arrangements, but the formal predominates, partly due to the fact that informal arrangements are often still quite localized and do not encompass the whole basin as yet, and partly due to the general failure of formal national and basin-level water management systems to appreciate the informal arm (Sokile & van Koppen, 2004). At the catchment and sub catchment levels, informal institutions gain strength and the patterns of the formal-informal interface become clearer.

This paper draws on a three years research on institutional assessment for water resource management in the Rufiji Basin in Tanzania. The intent of the paper is to share research findings on the point where formal state-based and informal grassroots community-based institutional initiatives for managing water converge and the problems emerging at that interface.

The paper is divided into seven parts. This first part covers the introduction, background to the subject and the methodologies used in the study. The second part covers conceptual issues on formal and informal institutions linkages and the third part covers empirical evidence. First, the interface between modern water rights and customary rights is discussed. This is followed by interfaces between Water User Associations and informal Associations of water users; between formal and informal power relations; and between formal and informal

conflict mitigation measures. The paper also highlights water rotations as an example of the successful formalization of informal arrangement for water management. Conclusions are drawn in part four.

### **Background to water resource management in Tanzania**

Tanzania already adopted a River Basin Management Approach for water resource management in 1980s when the country was divided into nine basins through Act No.10 of 1981, which was an amendment of the Principal Act No. 42 of 1974. Since then, there have been several initiatives on formal water management institutions. In 1991 the first National Water Policy was launched to augment the changes in the water sector. In 1993, the Rufiji Basin Water Board was launched and the Rufiji Basin Water Office started operating in the same year. Later, in 1997, the Principal Act for water management, i.e. the Water Utilization (Control and Regulation) Act No. 42 of 1974 was amended to accommodate further changes.

Early in 1995 a comprehensive review of Tanzania's water resources policies and institutions was carried out by the Government of Tanzania, World Bank and DANIDA (DANIDA & World Bank, 1995). The following year an inter-ministerial project, entitled River Basin Management and Smallholder Irrigation Improvement Project (RBMSIIP) was launched. The RBM component was hosted by the ministry responsible for water, while the SIIP component was lodged with the Ministry of Agriculture.

The Rufiji basin is the largest of the nine river basins in Tanzania, draining a total area of about 177,420 km<sup>2</sup> (URT, 1995). As shown in figure 1, it is made up of several river systems, the largest and most important (in terms of water utilization) of which is the Great Ruaha River (GRR) system. The Great Ruaha River is draining an area of about 83,979km<sup>2</sup>. The Great Ruaha River originates from a number of large and small streams at the northern slopes of the Poroto and Kipengere mountains in the Southern Highlands between Mbeya and Iringa. It flows to the Usangu plain where several other rivers flowing from the highlands join it; namely Mbarali, Kimani and Chimala whereas the small ones include Umrobo, Mkoji, Lunwa, Mlomboji, Ipatagwa, Mambi and Mswiswi rivers. Apart from these southern tributaries, the major tributaries of the Great Ruaha River include the Kisigo River, Little Ruaha, Lukosi and Yovi Rivers. The Great Ruaha River spills onto the Usangu plains, forming the Usangu wetlands (Western-*Utengule* and Eastern-*Utengule*) and feeding a perennial swamp (*Ihefu*) within the Eastern wetland. It then flows through Ng'iriama (an exit to the Eastern Wetland) on to the Ruaha National Park providing the main water source to the park, and to the Mtera dam, which is the main electricity generation source in Tanzania, accounting for 56% of the runoff to Mtera dam. As it flows down, it is joined by Little Ruaha River before being joined by the Kisigo River. It then passes through the Mtera reservoir, before flowing eastward to the Kidatu reservoir, being joined on the way by the Lukosi and Yovi rivers. From the Kidatu reservoir, it flows into Kilombero Plains before joining the Rufiji River (just above Steigler's gorge).

The Great Ruaha River serves many uses and users as it flows, including irrigation, hydropower generation, livestock, domestic uses, fisheries and aquatic flora and fauna. Irrigation is the major activity and largest water user; it is practiced all year round with supplementary irrigation in the rainy season. Other water-related livelihoods include fishing, livestock keeping and brick making. Problems arise in the dry season when conflicts and disputes over access to water become common. As much water is diverted to the fields for irrigation and brick making, the reduced river flows fail to supply full requirements downstream. This has also brought environmental concerns after the massive mortality and stresses to aquatic ecosystem. Downstream of the Ruaha National Park there are two hydropower stations (Mtera and Kidatu) depending much on the basin for their water for power generation, contributing about 50% of the Tanzania national grid.

### **Methodology of the study**

This study was conducted in the Mkoji sub-catchment, which is a part of the Great Ruaha River Catchment in the Rufiji basin between July 2002 and October 2004. For the sample selection, the catchment was divided into three hydro-geo-agricultural zones, namely the upper catchment, middle areas and the lower plains. In each zone, two villages were selected, making a total of six villages.

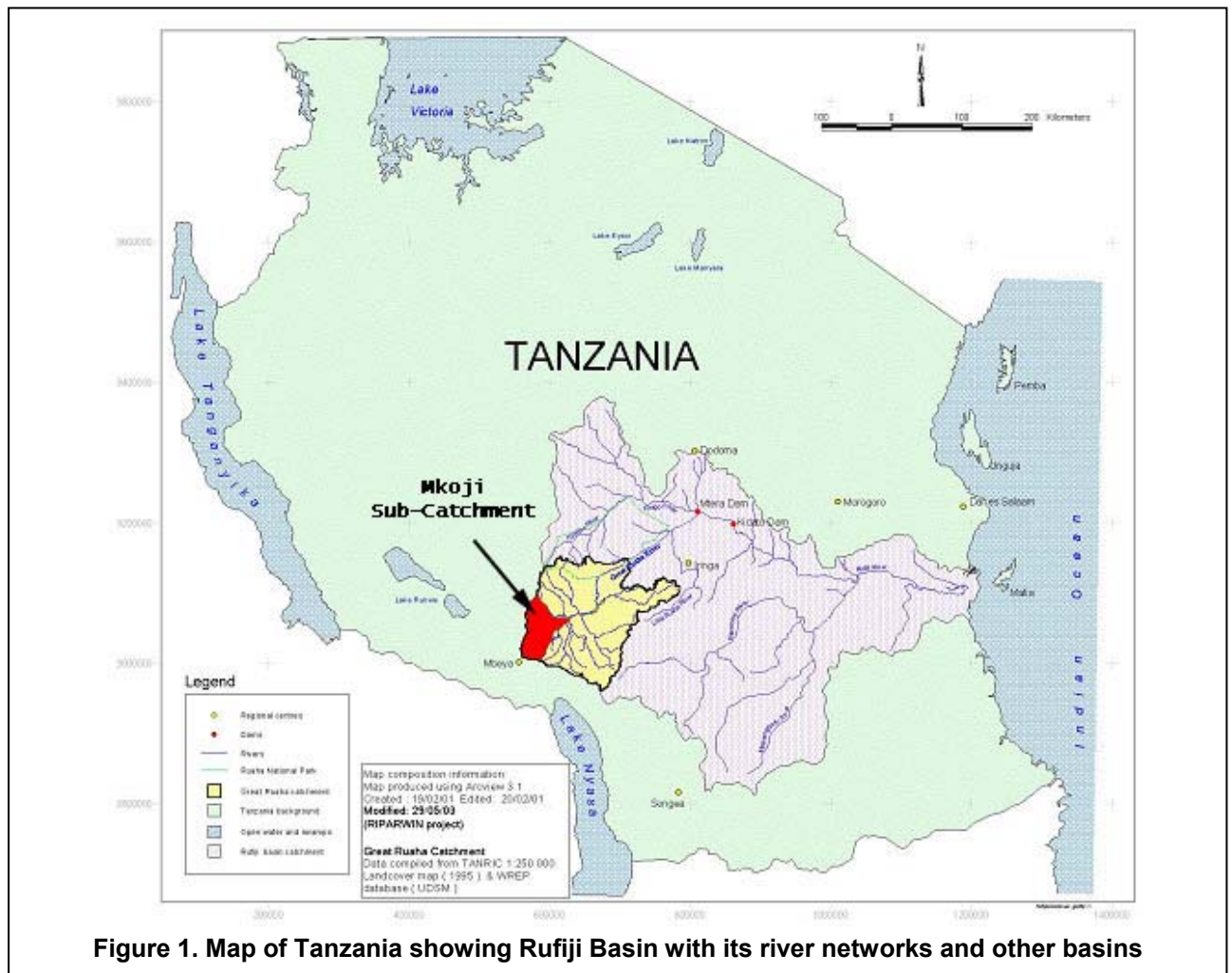


Figure 1. Map of Tanzania showing Rufiji Basin with its river networks and other basins

Three Participatory Rural Appraisals (PRAs) were conducted, one in each zone, to gather exploratory information on the subject matter. Semi-structured interviews were done with identified respondents, followed by focus group discussions in each zone with at least ten key informants and eight district officials from the two districts of the Mkoji Sub catchment were involved.

The study also involved role-play as methodology. The respondents were invited in the role-play River Basin Game<sup>i</sup> workshop. The findings were then analyzed and feed back to the respondents through a subsequent River Basin Game workshop. The River Basin Game is a wooden structure-based game that depicts different zones of a river basin and different uses in each zone. Water users play the game. Marbles are run along river basin to freely follow watercourses and diversions are made using sticks that are designed to represent off take structures. The series of stakeholder workshops acted as fora for triangulation of the findings and platform for pre-testing various way forward for the institutional changes recommended.

## The context of formal- informal water institution frameworks

Water management in the developing world is normally a mix of formal and informal institutions at different prefectures and different tiers. The role played by informal mechanisms in water management cannot be overemphasized. Unlike the formal ones, the informal institutions are not purposively designed at one moment. They rather evolve through continuous interaction (Commons, North 1990, Saleth & Dinar, 2004), normally in response to the prevailing situations (V. Ostrom & E. Ostrom, 1972, Saleth & Dinar, 2004).

These gradually and inherently evolving informal institutions have roots in the local communities and are embedded in and interwoven with the existing customs, traditions, norms, beliefs, folklores and tales.

Essentially, informal institutions tend to solicit more deference and recognition at the grassroots level of the lowest tiers of water management. At these lowest institutional tiers, the informal arrangements prevail over the formal ones (Sokile & van Koppen, 2003; 2004) at the interface with the formal set up.

Informal institutions may gradually become part of the formal arrangements and elements of formal institutions may taken up by the informal, depending upon a range of factors in a given context. The reality of the coexistence and interdependence of the two arms is inescapable in the water sector. In fact, informal institutions are partly extensions and local level translations of formal institutions; and formal institutions are also derived from and depend on the informal ones for their stability and strength (Saleth & Dinar, 2004).

Generally, there is a huge body of empirical literature on institutions, arrayed from old institutionalism (Commons, 1934, Tool, 1977, Davis and North, 1970 Bromley, 1985) and neo-institutionalism (North, 1990) to modern transaction cost theories of institutions and agency and contract theories (Saleth and Dinar, 2004; North, 1997, Eggertsson, 1990,). Nonetheless, the large body of literature on water management institutions displays inadequacy on their treatment on the institutional interface (Saleth & Dinar, 2004) especially on the formal- informal frontier (Sokile et al, 2002, 2003; Sokile & van Koppen, 2004). There is generally a paucity of research findings on the convergence between formal and informal institutions.. The research agenda on recent water reforms certainly tends to bypass and ignore the contribution of customs, norms, traditions and local initiatives to the management of water, throwing the baby with wash water and forgetting to ‘collect fire from the ashes’ (Sokile & van Koppen, 2003; 2004).

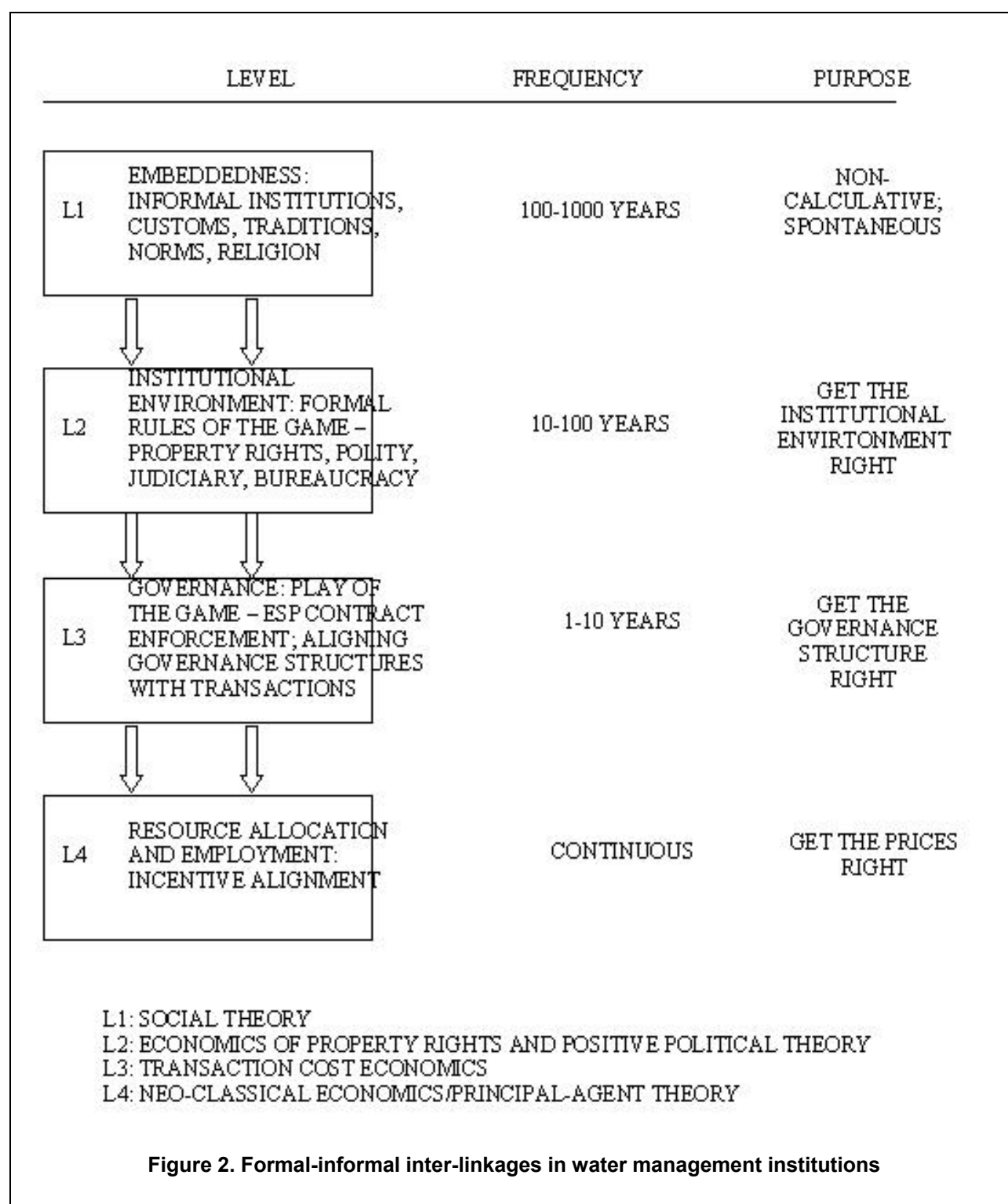
Institutions are diverse and dynamic. They involve constitutional code, organizational order as well as normative/ customary behavioral changes. Whereas the constitutional order characterizes the rule-making process that includes the making of the national constitution and the related governance framework, the organizational arrangements are determined by the institutional code that is characterized by by-laws, regulations, associations, contracts and conventions that are created within and by the constitutional order (North, 1981; 1990; Douglas, 1986 and Ostrom, 1990). The normative behavioral code, on the other hand, relates to cultural values, customs and norms that legitimize the institutional arrangements and constrains the behavior of individuals and groups in the society.

As institutions change, societies adjust themselves accordingly to adopt the changes (Shah et al, 2000, Williams, 1999). According to Williams (1999), the adaptation is captured in a four level phenomena as shown in Figure 2 below, the adaptation starts with the social embeddedness level which encompasses customs, traditions, mores and religion. At this level, there is a very gradual change. This is followed by the second level that involves the institutional environment of a society that encompasses formal rules, constitutions, laws and property rights. The third level deals with issues of governance that basically covers motivations related to the former levels, i.e. how the incentives and enforcement are aligned. The last part focuses on resource allocation and employment and is concerned with getting the prices of transaction right.

## **Interfaces between formal and informal institutions**

### **Central level: The Ministry of Water and Livestock Development**

Although the thrust of current water resource management in Tanzania is to implement water management at the basin level, the central ministerial level continues playing a significant role in water management and the coordination of all nine basins in the country. However, the current national structure does not provide for the requirements of the new National Water Policy (2002). The central level is responsible for developing, disseminating, monitoring and evaluation of the National Water Policy 2002(URT, 2002). A new structure is being proposed in the draft new Water Resources legislation (2004, draft). Further, the National Water Policy is also translated into three separate Legislations: the Water Resources Development Act, the Rural Water Supply Act and the Urban Water Supply Act. Of the three sets of legislation, the Water Resources Development Act (2004, Draft) concede to the administration of both informal, local and customary water use permits (formerly water rights) and to the formal ones and, unlike earlier legislation, provides for a possible interface between the two systems of access to water.



### Basin level: The Rufiji Basin Water Office

Like the national ministerial level, the basin tier is dominated by formal arrangements. The elements of informal institutions are few and petite. The Rufiji Basin Water Office (RBWO) was set-up as per Act No.10 of 1981, for mandates, tasks and roles provided in this Act for Basin Water Boards. The basic tasks of the basin office are:

- Allocate and regulate the existing and new water rights within the basin;

- Monitor water availability, water quality and water uses in the basin
- Control water pollution
- Collect the water user fees as per water law and Regulations
- Mediate and resolve water conflicts within the basin.
- Establish Water User Associations as per Act No. 42 of 1974

Although the Basin Water Office does all these functions with little or no involvement of the local communities, there is a potential of associating the informal institutions in managing water by jointly undertaking the above functions. However, the capacity of the Basin Office is limited in terms of its human and financial resources, given the extensiveness of these tasks in the largest basin of Tanzania (Sokile et al, 2004). The RBWO thus depends on the collaboration between a number of existing and new institutions in the execution of these tasks on the ground, especially for the regulation and distribution of river water flows during the dry season; the collection of water user fees; the construction of new infrastructure, and most importantly, the mediation and resolution of water conflicts.

Potentially, essential synergies can be tapped by aligning formal and informal institutions. For example, the Basin Water Office may solicit support from the informal institution in the villages. Grassroots water users may be mobilized to discuss and agree on the amount of water to be allocated to various uses/ users and then be empowered to oversee and regulate the allocation. Similarly, the village leaders- formal or informal- may be involved in monitoring water availability and quality through gauge reading and through development and implementation of bylaws for pollution prevention. However, apart from some isolated initiatives along these lines, the partnerships between the RBWO and local communities are still largely to be forged.

#### ***Catchment level: The Mkoji sub catchment***

At the catchment and sub-catchment levels, there is a fair interface between formal and informal institutions. The formal arm of water management in the Mkoji sub-catchment comprises two district councils, and several wards. Three to seven villages make up a ward. Wards are important tier in the governance structure. Although not specifically formed for managing water, wards influence water management considerably. The Ward Development Committees frequently pass bylaws that impact on sanctions and penalties that seek to guide water allocation and quality.

Each ward has a Ward Councillor. Ward Councillors are very influential in the villages and in water resource management. Ward Councillors represent the community members who elected them into power in the district council. Owing to their electorate, councillors, seeking to please their voters tend to be more informal and highly interact with informal institutions, which influence water management. Councilors in the lower zones of the Mkoji sub-catchment have, for example, been reported to mobilize downstream water users for negotiating for water upstream, mobilized funds for domestic water supply, pushed by-laws for water management at the District Council, and mobilized communities towards the formation of WUAs.

This is not to say that the functioning of Ward Councillors is smooth or perfect. They may also battle with popular opinions and sometimes counteract customary arrangements. For example, in 2002 in the upper catchment of the Mkoji sub-catchment, Ward Councillors had to struggle very much with the idea of cutting of alien riparian tree species, especially *Eucalyptus spp*, as per the directives of the Mbeya rural district council while the customs object cutting trees. The tag of contention here is that, while customs bar people from cutting riparian trees, the formal institutions tend to support the same.

Although district, ward and village councils may deliberate on decisions that affect water management, a specific mandate for this lies within the Rufiji Basin Water Sub-Office at Rujewa, the main town in the Mbarali district. The sub-office coordinates water management through Water User Associations (WUAs) and village committees in case where there are no WUAs. Generally, there is no specific provision for taking on board the local and customary views into the formal councils and committees. Occasionally, however, the basin sub-office has used informal community leaders in implementing some of the water management activities, especially in resolving water conflicts. The results have been very impressive.

***Local Level: The Village and Below***

The lowest tier of formal institutions in Tanzania is the village level. The informal arrangements for water management are more elaborate at the grassroots level. There, formal and informal initiatives for managing water clearly co-exist. Each village has a village assembly of all adults, which elect 25 representatives to form the Village Council. The Village Council operates through three mandatory committees, which are vested with responsibilities for handling daily affairs of the village: the Finance, Economic & Planning Committee; the Social Services and Self-reliance Committee and the Law and Order Committee. Water sub-committees fall under the Social Services and Self-reliance Committee.

The strength and functioning of the village sub-committees differ from one village to another, and similarly, their specific intervention into water affairs also differ depending on the availability and the levels of demand on the water resource. In places where irrigation is carried out only in dry season or is not carried out at all, like in the villages in the upper catchment, the water sub-committees are relatively redundant. There, the informal arrangements through customs, taboos, and traditional rainmakers tend to be more popular and respected. Conversely, in the middle zone of Mkoji sub catchment where wet season irrigation is highly practiced, there is an active formal Water User Association, which handles both domestic and irrigation water management.

Seemingly, whenever the formal village sub-committees are weak, there is a stronger informal institution that assumes the roles and fills the gap.

**Interface between modern water rights and customary rights**

Mkoji sub-catchment is a true replica of the current water reform in Tanzania, including its key component: the need to obtain water rights and pay water fees. The new Water Policy (2002) requires water users to mobilize and organize themselves into associations, especially into WUAs, to apply for water rights, and to pay application and user fees. Many users at the Mkoji sub-catchment have already formed WUAs and have applied for the rights. Specifically, the law bars abstraction of water for whatever purpose without a prior paper-based license or water right.

Irrigation has been practiced in some parts of the sub-catchment for many decades through traditional canals, which demanded no paper-based formal rights. In some cases some users had applied and acquired for the paper-based rights individually. With the new institutional arrangement, there are contradictions within the formal institutions (i.e. modern vis-a-vis existing institutions) on the one hand; and between formal and informal ones on the other hand. The formal contradiction is especially strong because the Water Policy (2002) requires the formation of new institutions (formation of WUAs, water charging mechanisms, water rights, etc) within an existing institutional landscape. The challenge here is to align the new formal initiatives consistently with the former formal initiatives as well as to shape the interface with the informal arrangements. The contradiction arises that, whenever the new formal institutions have tried to build on the existing ones, there has been duplication of efforts and sometimes collision of roles. For example, in Imezu and Itewe villages in the upper catchment, both a new WUA and an existing formal water committee want to control water allocation.

Another problem in cases where formal mechanisms have provided explicit support to initiate and form new institutions, is that existing structures have been ignored, relegated or bypassed altogether, so that new institutions have being inadequately integrated in, and accepted as part of, the existing institutional landscape. Thus, the institutional reform risks failing completely. For example, in the middle and some parts of the upper Mkoji, water users who used to access water through traditional canals repeatedly deject recent arrangements that require a paper-based license and a modern concrete intake for farmers to attain water rights.

In contrast, trying to reshape the new IWRM institutions with a minimum of external support entails the risk that the new institutions are essentially again the existing ones, with the institutional reform resulting in a mere “cosmetic” operation of changing labels (Sokile et al, 2004).



A last contradiction between the formal and informal observed is the lack of any mechanism to ensure access of water to those who are yet to apply for modern water rights, especially pastoralists who are further downstream of the sub catchment.

## **Interfaces between Water User Associations and informal associations of water users**

The National Water Policy recognizes informal water user associations since 1981 as the lowest level of water management institutions. Generally in Tanzania, small associations or cooperatives of water users cover areas commanded by a single furrow, one domestic water supply scheme (group or single) or various furrows in a given village or ward. Some were registered. Since the reviving of water rights and fee payment in the mid-1990s, these newly registered Water User Associations (WUAs) are not only expected to play an important role in the operation and maintenance of local water infrastructure, but also in the allocation and administration of water rights and the collection of water fees.

The new formal WUAs operate through a set of formal principles, including attending meetings, electing leaders, developing by-laws etc. In the case of operations, however, several challenges have been noted. For example, attendance to WUA meetings is far less than expected, especially among women and the levels of abidance to the WUAs by-laws are low. In Ikhohe and Idunda villages in the upper Mkoji sub-catchment water users feel more committed to the customary arrangements for access to and allocation of water than to the WUA driven ones.

Before the onset of WUAs, water users had other means of associating among themselves. Locally, water users associate in labour-based farming groups called *njaanwa* in the Mkoji Sub Catchment; local groupings for implementing water rotations called *kamati ya zamu* and other dynamic local groupings among water users. Unlike in WUAs where membership is long-term and compulsory and requires subscription, membership to the local groupings is open and dynamic. There are also duty-based canal cleaning groups called “*Maendeleo*” or ‘*msaragambo*’. The communal associations were fluid enough to contain water demand variations in dry and wet seasons and had adequate mechanisms for sanctioning allocations. Normally, a culprit would be dissociated from peers and /or would be wished bad omen.

Formal WUAs have little contact to informal local associations of water users. Furthermore, the formation of WUAs has neither built on nor encouraged the existing local associations of water users. While the formation process of WUAs requires users to come together, hold meetings, write constitutions, pay monetary membership fees and apply for registration with some supra institutions, the informal associations simply require one to have a stake in the water use undertaking.

## **Interface between formal and informal power relations**

Tanzania abolished chieftdom officially in 1961 at its Independence. In some places, however, traditional and customary leaders have been co-existing with the new formal local governments and are somewhat influential. In the upper zones of the Mkoji sub catchment, among the local ethnic group of the Wasafwa, there exist an array of traditional leaders called *mwene* (Pl. *mamwene*). *Mwene* is a chief to this ethnic group. Each *mwene* commands an area of roughly a new ward. Powers of *mamwenes* are more elaborate in water and natural resources management where they enforce customs and traditions against cutting riparian trees, cultivating on water banks and polluting water bodies.

Both customary and formal institutions display power and influence power relations at various degrees. Formal institutions display powers by the virtue of the state and formal rule of law, while the informal ones acquire power through customary influences and beliefs. Since the formal arrangements are backed by state power and the rule of formal law, those who incline and abide with the state are at an advantage. For example, the water requirements of the users who hold formal water rights and pay for water fees are paramount compared to a local user who wished to access water.

In the Mkoji sub-catchment, local informal associations are influential, powerful and attractive to the local communities. Most people feel a stronger sense of identity and belongingness than in the formal set ups. In some places, formal institutions draw from informal ones and vice versa. For example, informal leaders may play a role like the formal ones. In the upper Mkoji catchment, and in other parts of the Mbeya rural district, *mamwene* serve as chairmen of the Environment Subcommittee in the village government. Whenever such arrangements have existed, there have been some pros and cons to the same. As part of the formal village government, traditional leaders enhance compliance of the rule of law and of water management practices. However, placing *mamwenes* as chairmen of a sub committee contradicts free and fair election and democratic principles (Sokile & van Koppen, 2004), and skill-based leadership.

In Inyala ward for instance, a power struggle exists between the water committee, informal canal committees and the newly introduced WUA. The new WUA has been introduced, yet the village water committees had not been repelled. Yet, water users seem not be getting institutional satisfaction from either of them; thus they have formed their own canal committees. This is a challenge to the bureaucracy that may not have listened to the institutional aspirations of water users. The message accrued there is: are we forming empty institutions? Do the newly formed formal institutions address the current challenges of water management? Or do they simply perpetuate further power struggles while ‘managing’ water resource at the ground level?

## **Interface between formal and informal conflict mitigation measures**

Formal and informal institutions interact appreciably in conflict resolution at the local level. Most disputes on water are resolved informally at the lower levels before they erupt into serious conflicts. This conflict resolution dynamic is not normally outspoken. Six tiers are identified where informal-formal conflict resolution takes place (Sokile & van Koppen, 2003, 2004):

- One to one level between the victims: both parties speak out and agree on resolving the conflict.
- Local elders level: normally those who are well known to both parties and who can appreciably solicit trust among the parties.
- Canal committee level: this is a semi-formal level since the committee members are in some places elected among water users and in other areas they assume responsibilities *de facto*.
- Customary village leaders level: there is a village reconciliatory committee (*baraza la usuluishi*), which is made up of elected/appointed elders and resides over local conflicts, especially on resources, marriages and related cases.
- Ward level: the Ward tribunal, while established formally through election, it operates according to customary principles, focusing on reconciliatory rather than punitive rulings.
- Basin and/or catchment level: the Rufiji Basin Water Office and the sub-offices mitigate conflicts when local solutions have failed and where the claimants do not wish to go to courts of law.

Local water users prefer informal routes over formal ones because they feel a greater sense of identity and hope for justice than they would experience in the courts of formal law where decisions are based on ‘I loose-you-win’ or ‘I win-you-loose’ principles. Such parallel forums provide an effective conflicts resolution institution for managing water conflicts at a lesser cost.

The formal arm of conflict resolution involves village committee meetings, primary courts and district magistrate’s courts, in cases where the conflict has escalated higher, and the Basin Water Offices in cases where they need a formal forum but are afraid to go to the courts of law. Apparently, the costs of abiding with formal and informal institutions in water management differ. The formal route is expensive, time-consuming and less trusted among local communities (see also, Maganga & Juma, 2003; Sokile et al, 2002; Sokile & van Koppen, 2003; Sokile & van Koppen, 2004). People have more reverence for informal customary institutions than formal ones.

The other formal-informal interface in conflict resolution mechanism is explicated by the Primary Courts. Although the Magistrates Courts Act, 1984, establishes Primary Courts statutorily as a local judicial system, the system tends to appreciate the strength of customary law and practice. For example, the interpretation of customary law in Primary Courts is effected through the system of Court Assessors who sit in Primary Courts.

The Court Assessors are drawn from local community elders who are considered wise enough to advise the Primary Court magistrates. The legislation requires that in every proceeding in the Primary Court there must be at least two assessors. The study found out that in all courts, there were two or more assessors from different ethnic groups (SMWUC, 2001; Sokile & van Koppen, 2003; 2004).

## Water rotations: A successful case of formalized informal arrangement for water management

Water rotations (popularly known as *zamu* in the Usangu plains) provide an interesting and successful interface of formal and informal institutions in water management. In the Mkoji sub-catchment, along long stretches of streams, both water users who have formal water rights and those who do not are increasingly realizing that the available water resource is not enough even for the water right holders.

In the peak of dry season (September - November), all water users come together and agree on how to share water through rotational arrangements (*zamu*). This is done without external formal interventions. A weekly roster is set and agreed upon and each use prefecture, commonly referred to as *wana-zamu*, i.e. the bearers of the rotation appoints members to make up a loose committee to oversee the water rotations. Each prefecture takes the rotation further to make up an intra-canal rotation. The table below shows such rotation schedule between intakes, taking the case of three villages along Mlowo River in the middle Mkoji sub catchment. With exception of the Ipatagwa and Motombaya improved irrigation schemes that receive water throughout the week even during this period, the remaining intakes are scheduled in a weekly rotation.

**Table 1. Water use rotational roster in the Middle Mkoji Sub Catchment**

No	Day	Who irrigates
1	Monday	Motombaya irrigation scheme (Formal water rights)
2	Tuesday	Motombaya irrigation scheme (Formal water rights)
3	Wednesday	Langwira pasture farm (Formal water rights)
4	Thursday	Langwira pasture farm (Formal water rights)
5	Friday	Mhwela village (Informal access to water- customary right)
6	Saturday	Mwatenga and Kilambo villages and NARCO ranch (both formal and informal rights)
7	Sunday	Water flows free in the river. No abstraction

Source: Sokile & van Koppen, 2003; 2004

The informal rotation groups (*zamu*) and labour groups (*njanwaa*) have a great potential of contacts and mutual interaction, although this potential is yet to be realized. The groups interact in terms of membership and places where they operate. There is however, no mechanism as yet for synchronization of their undertakings, for example, for making sure that when it is the turn (*zamu*) of water users to access water, they also work together (*njanwaa*) in the fields to maximize water use without any losses. This vital interface mechanism requires further examination for maximum benefit.

## Interfacing formal and informal institutions in water management: no easy task!

In sum, shaping a harmonious interface between the formal and informal institutions for water management may not be that simple. Institutional contradictions, power struggles, bypass and duplication of activities are likely to be encountered, unless a specific effort is made to foster harmony within and between the multiple institutional frameworks.

Gaining effective centralized and decentralized water management institutions requires formulating interface mechanism that will ensure sufficient contacts and overlaps without unnecessary contradictions. This also concerns the vertical interactions between the ministerial level and the basin levels, the basin level and catchment levels, and the catchment levels and villages levels. There is still a considerable gap in knowledge on the processes through which the informal arrangements feed into and sustain the formal water management systems, which requires elaborate further study. Critical focus areas are grassroots levels, especially the village level, the WUAs level and the Primary Courts level.

In the Primary Courts for instance, the court ruling is based on the decisions of the majority of Court Assessors and the presiding Primary Court Magistrate (Maganga & Juma, 2002; Sokile & van Koppen, 2003). The Court Assessors translate the underlying principles and dynamism of customary law in that particular case and advise the magistrate to come up with a sound judgment on the matter. A key challenge faced here is the question: customs of which ethnic group should be followed? For example, the ethnic composition of Court Assessors in Chimala, Ilongo and Igurusi Primary Courts in Mkoji sub-catchment encompasses more than four ethnic groups, which all have more or less different customary water management principles (Odgaard 1999; Maganga and Juma, 1999; Sokile et al, 2002). Such complexities have also been seen in cases where *mamwene* have been incorporated in the formal village government.

## Conclusions and recommendations

Institutions are wide, complex and varied. They range from formal, well-established policies and legislative and organizational set ups that are interwoven from central, basin, catchment to local levels on the one hand, and an elaborate, complex customary institutional mix embedded in local informal relations, which involves customs, traditions, norms, culture and local practices on the other hand. Both formal and informal arms of institutions are important in water management and they are fully interdependent. As such they display a wide array of types of interfaces. Various interfaces of formal and informal institutions have been illustrated above, including the interfaces between centralized and local institutions, formal water rights and customary rights, Water User Associations and informal associations of water, formal and informal power relations, and the complexity of institutional interfacing. As displayed in these cases, especially at the grassroots level, the formal ones may not be successfully operational without the informal ones, and vice versa.

There are no full-fledged mechanisms as yet to better align the formal and informal. In some cases there is only superficial contact among similar institutions resulting into uncoordinated interventions, bypass and duplication of efforts, while in other cases there are troublesome overlaps resulting into power struggles and collisions in operation mechanisms. This implies a challenge to the bureaucracy in the ongoing water reforms that new initiatives may frustrate ongoing efforts or may not bring an added value whatsoever.

Formal institutions i.e. policy and legislation on water resources management should assign more room for the other side of the coin - the informal side, as it has a lot to offer for achieving today's water management imperatives. Water managers at different levels should appreciate formal-informal interfaces and encourage the better coexistence of the two arms at various tiers and prefectures of water resources management.

There is a need to build the capacity of water managers, users and other stakeholders on the importance of both formal and informal institutions at the catchment and grassroots level specifically, where the formal-informal linkages are clearer. There is also a need for a comprehensive study to examine the formal-informal institutional linkages and interface mechanisms especially at the grassroots level. The successful cases of the formal-informal institutional interfaces should be encouraged and be emulated for better use elsewhere.

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