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***Viewpoint* – A Hybrid Approach to Statutory Water Law to Support Smallholder Farmer-Led Irrigation Development (FLID) in Sub-Saharan Africa**

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ABSTRACT: Millions of small-scale farmers in sub-Saharan Africa who are driving farmer-led irrigation development (FLID) have been turned into criminal offenders or, at least, categorically marginalised under widespread water permit systems. Under these systems, small-scale water users are obliged to apply for a permit, but very few have done so, largely because states lack the administrative capacity to inform such large numbers of people scattered across widespread rural areas of this obligation, to process large numbers of applications and to enforce conditions tied to permits. Those who use water below a usually very low threshold are exempted from this obligation, but small-scale farmers are generally above this category. This viewpoint, based on research and policy dialogues in a range of African countries, elaborates an alternative that addresses these injustices: a hybrid approach to water use authorisation. The proposed hybrid approach provides a suite of tools to legalise the water use of smallholder farmers and to overcome the colonial legacy of the side-lining of customary water law. These tools which can be combined and adjusted to suit specific contexts include: permits, targeted at, and enforced for, the relatively few high-impact users; collective permits; non-permit tools, in particular, first, general authorisations with equal or priority legal standing relative to permits and, second, the recognition of customary water law; and prioritisation.

KEYWORDS: Sub-Saharan Africa, water law, legal pluralism, decolonisation, permits, water allocation, customary water law

RATIONALE FOR THE HYBRID APPROACH

Millions of African small-scale farmers are investing in groundwater lift irrigation, gravity canals and storage devices, wetland management and other agricultural water management methods (Woodhouse et al., 2017). The total areas irrigated and the total numbers of private small-scale irrigators outpace those of public investments in storage and irrigation. In Ghana, the number of privately financed small-scale irrigators was estimated to be 45 times those in state-funded irrigation schemes, with the area covered being 25 times greater (Giordano et al., 2012). In Mozambique, Vilanculos and Macuacua (2010) estimated the water use of such small-scale irrigated fields in the well-developed Lower Limpopo Basin to be as high as 48% of the – mainly agricultural – total water use. In South Africa, remote sensing studies estimated that informal irrigation in the former homelands in Limpopo Province was around 70,000 ha – at least three times as large as public irrigation schemes (van Koppen et al., 2017). These informal investments contribute to national goals on meeting the right to food, to household and national food security and to broad-based economic growth. Recognising this

'revolution already in progress', in the World Bank's words (World Bank, 2018), policy attention by the Bank, governments and others is rightfully shifting to identifying innovative fit-for-purpose support.

This great potential and impressive endogenous investment continues to grow and these investors need security – which means that the legal nature of their water use must be addressed. Yet statutory water legislation in most¹ African countries results in these small-scale investors being defined as offenders because they do not have a permit (or licence) to abstract and use water when their water use is above the micro-scale use that is exempted from a permit (see Table 1 for a description of exempted water use in select countries). As reported in Kenya, some small-scale farmers who had spent their meagre incomes on purchasing pumps and irrigating their crops so as to feed and clothe their families were held in custody in a police office for not having a permit (water official, personal communication). In most cases, these farmers are not aware of the requirement to have a permit. Under-resourced water authorities lack the capacity to inform and educate the massive numbers of smallholders of the requirements, to process the large number of permit applications and to monitor and enforce the conditions of such a large number of individual permits. Even the relatively well-resourced government of South Africa explicitly concludes in its National Water Resource Strategy 2nd Edition: "Current licensing processes are often costly, very lengthy, bureaucratic and inaccessible to many South Africans" (DWA, 2013: 48). The scale of the challenge will not be easily solved by increasing the staff and budget of water authorities.

An alternative, Africa-appropriate approach, is to replace the current monolithic permit systems with a hybrid approach to water use authorisation that brings together a number of tools: targeted permits (individual and/or collective), exemptions with equal legal status, prioritisation of small-scale water use, and equal legal standing of customary law practices that are in alignment with constitutional requirements. This proposed approach is the outcome of the action research "Water law reform to improve water security for vulnerable people", conducted in Kenya, Malawi, South Africa, Uganda, and Zimbabwe in 2016-2018 by IWMI and the Pegasys Institute, as part of the DFID-supported REACH Programme of Oxford University, and of earlier research in Burkina Faso, Ethiopia, Ghana, Mozambique, Nigeria, Swaziland and Zambia. Literature on the histories of water legislation and customary water law was reviewed and current implementation challenges and solutions were studied from local to international levels, and discussed in policy dialogues with senior water managers. Instead of providing water managers with only a hammer that criminalises and marginalises smallholder irrigators (permits), the hybrid approach provides a range of tools that can be used selectively to support smallholder irrigation, regulate high-impact users and achieve constitutional rights to water and food. These tools can be combined and adapted according to state implementation capacity, specific hydrological and socioeconomic conditions and critical water management issues from the local to the basin level.

As elaborated in the remainder of this viewpoint, under this approach, permits remain an important regulatory tool, targeted at the relatively few high-impact users who, based on the volume and potential impact of their water use, need the most stringent regulation, and who can be regulated within governments' means. Other tools fill the void for the remaining majority of users.

¹ According to FAOLEX, 41 of the 51 sub-Saharan Africa countries have permit systems (exceptions are Eritrea, Gabon, Gambia, Guyana, Liberia, Madagascar, Maldives, Seychelles, Somalia, and South Sudan).

PERMITS

Current permitting

The promulgation and implementation of 'modern' permit systems has gained momentum since the 1990s. High-income donor countries promoted permit systems as global best practice and as a critical ingredient of Integrated Water Resources Management (IWRM). In spite of their limited administrative resources, water authorities in Africa have tried to implement permits as a regulatory tool. In doing so, due to capacity constraints, the number of permits that have been issued is only a fraction of the total number of water abstractors who are legally required to apply for a permit.

Table 1. Number of permits issued, estimated number of rural irrigators requiring a permit and exempted water uses

Country	Number of permits by 2016	Estimated number of irrigators requiring a permit (5% of rural households) ²	Exempted water uses in the legislation
Kenya	4,194	302 342	Domestic purposes without the employment of works
Malawi	3,042	128 650	Household and sanitary purposes and watering and dipping of stock (less than 30 livestock units); irrigating a subsistence garden (of less than 0.5 ha) and a subsistence fish pond.
South Africa	5,956	160 650	Reasonable domestic use: (ii) small gardening not for commercial purposes; and (iii) watering of animals (excluding feedlots); roof- water harvesting; and firefighting. Surface water threshold volume in stressed basins set at 2000 m ³ /year/household.
Uganda	1,320	274 633	Domestic uses, firefighting or irrigating a subsistence garden (of less than 0.5 ha) and a subsistence fish pond
Zimbabwe	10,799	93 500	Reasonable uses for basic domestic human needs in/around residence, animal life [no fish or feedlots using 10 m ³ per day or more], private brick-making, dipping) without sinking a borehole.

These permit holders include the small number of high-impact users. An analysis of the cumulative volumes used by the relatively few largest users and by the larger numbers of permitted small-scale users shows wide inequalities. In the Inkomati Basin in South Africa, for example, data from the Water Authorisation and Registration System of the Department of Water and Sanitation show that 7% (154) of the registered water users use 83% of the water (Schreiner and van Koppen, 2018). This picture is not much different elsewhere. In the Wami-Ruvu Basin in Tanzania Sumuni (2016) found that of the 960 permits issued in the basin, 30 used 89% of the water allocated while the remaining 930 permit holders used only 11% of the water.

In Kenya, four categories are distinguished in permitting processes, from small to large: A to D. Anyone using a mechanised system for abstracting water, no matter how small, must obtain the appropriate authorisation under one of these categories. Category D water use applications undergo the most

² Since the actual numbers of small-scale irrigators in these countries are not known, a ratio of 5% of rural household was used to give some indication of the possible number of irrigators involved and that are likely to use water up to an extent where they could not be exempted from a permit.

intensive and centralised assessment processes as they have the greatest impacts. By June 2015, 4046 surface water and groundwater permits for the categories B, C and D had been issued (see Table 1). The 251 D-permits constitute 6% of the number of permit holders, but 98% of the total volume of water used under category B, C and D permits (Shurie et al., 2017).³ Even very small-scale users, those using a small mechanised pump for example, must apply to the state for a Category A authorisation even though most of them do not – they are generally not aware of this obligation. Administrative requirements for obtaining an authorisation under category A are light and once it is established that an application falls within this category (e.g. a low risk of impacting water resources), permission to use a mechanised system to draw water is given and no renewal is required (the authorisation does not specify the volume of water that can be abstracted).

Permits targeted at high impact users

The proposed hybrid approach builds on these current practices: permits are endorsed as an effective regulatory tool *targeted at high-impact users*. By tying particular conditions and their enforcement to permits, the state can restrict the amount of water used, control water pollution, check dam safety, or insist that these high-impact investors develop water storage instead of allowing direct water abstractions, as in Kenya. It is also critical that permit applications by high-impact national and foreign investors follow the due process stipulated in the legislation. This includes the widespread obligation on the state (not well implemented currently) to inform and consult existing water users who might be negatively affected by the planned water use – including small-scale users. Where negative impacts are likely, affected lawful users should be able to object to a permit application or negotiate the sharing of benefits or compensation. These duties align with the procedural rights of the General Comment 15 on the human right to water by the United Nation Commission on Social, Economic and Cultural Rights; and with the gist of the Voluntary Guidelines on the Responsible Governance of the Tenure of Land, Forests and Fisheries (Hellum et al., 2015; HLPE, 2015).

Targeted permitting is an effective regulatory tool. It also enables the generation of revenue from large-scale users, avoiding the high costs and low returns to the state of making many small-scale users pay small amounts of money.⁴ The key challenge in current water legislation is that permits (plus exemptions for micro-scale use) are the exclusive tool for declaring water use as lawful but states do not have the administrative capacity to implement them effectively. As a result, smallholders investing in their own infrastructure are expected to apply for permits, but, not having the means to do so or, often, the knowledge that such is required, are criminalised and marginalised. This is the logical extension of the introduction of water permits by colonial powers long before they were revived by IWRM initiatives. The broader suite of tools in the hybrid approach seeks to decolonise these skewed entitlement dimensions. The following brief history of permit systems clarifies their colonial legacy.

³ According to the Water Resources Management Authority of Kenya (WRMA, 2007), the parameters for each of these categories are defined according to the hydrological context of particular catchments. Each of the categories is defined in a rather loose way as follows: Category A: Water use activity deemed by virtue of its scale to have a low risk of impacting the water resources; Category B: Water use activity deemed by virtue of its scale to have the potential to make a significant impact on the water resource; Category C: Water use activity deemed by virtue of its scale to have the potential to have a measurable impact on the water resource; Category D: Water use activity which involves either international water, two different catchment areas or is of a large scale or complexity and which is deemed by virtue of its scale to have a measurable impact on the water resource.

⁴ Recent research in progress by IWMI and PI indicates the high costs and low returns associated with charging small-scale users for water.

Permit systems: Legacy of the colonial water grab

Permit systems were introduced by colonial powers who claimed blanket ownership of relevant water resources (mainly surface water at the time). In 1929, Kenya's Water Ordinance stipulated permits as the sole formal route for legal water use, but permits were only allocated to settlers, thus formalising and justifying the colonial water grab. The Water Act of 1927 of Southern Rhodesia (now Zimbabwe) allocated riparian rights to the white self-declared landowners, and required permits for all other water uses by settlers, such as enterprises or municipal water supplies. Besides ownership claims, the conditions of permits provided useful hydro-technical information to the newly established water authorities and a partial recovery of their costs.

Although prior 'native' water arrangements were explicitly 'recognised' in these first laws, the recognition indirectly created a weaker status for customary African water law relative to colonial statutory law. At best, isolated and 'duly selected' Africans could obtain a marginal voice in settlers' water management decision-making bodies and white commissioners would be 'informed' about likely 'substantive negative impacts' of planned investments on Africans' prior water use. In this way, the asserted 'lawful' ownership and permitted use of water-served colonial state building and legitimised the race-based water grab for the hydraulic mission to develop settlers' minority economies (van Koppen and Schreiner, 2018).

At independence, colonial ownership shifted to state custodianship of water resources. Permits (and exemptions to permits for very small uses) remained the exclusive way to define water use as lawful, and customary water arrangements continued to be excluded. Suddenly, instead of a small colonial minority, in the countries where permit systems were introduced, large numbers of water users were obliged to apply for a permit, as "one cannot exclude the majority" (water authority official Tanzania, pers. communication) but the permits systems remained largely dormant until the 1990s. They were revived as part of the IWRM discourse and funding in the later 1990s. Marketed as 'best global practice', the adoption of permit systems was also promoted in countries that had not historically had them such as Ghana, Uganda and South Africa.

This new generation of permit systems were made more complex than their colonial predecessors by the inclusion of groundwater; the extension of permits to a greater range of water-related activities; the need to address environmental flows; increasingly detailed conditions; shortened durations requiring more frequent renewal; lowered thresholds of exempted uses; and, in the neo-liberal era after structural adjustments, by an intensified focus on revenue collection. When implementation was taken up, the logistical burden of reaching fast-growing rural populations exceeded the capability of the state. Thus, the earlier marginalisation of African water use under customary arrangements turned into the criminalisation of the majority of small-scale water users above the threshold but without a permit, whose water uses continue to be governed by today's living customary arrangements. The hybrid approach proposes the use of various other tools to complement targeted permitting and overcome this legacy, as discussed below.

Collective permits

In addition to the use of individual permits for high-impact users, collective permits which would have the same legal status as individual permits can be used to protect organised customary water users against competition from more powerful water users – making clear that water resources are not 'not already appropriated' as is still often the case. Collective permits can be issued to groups of water users who then share the water between themselves according to appropriate, and accepted, local arrangements which may be based on customary practices or more formal, written arrangements, or both.

NON-PERMIT TOOLS

In addition to the use of targeted individual and collective permits, the hybrid approach proposes the use of non-permit tools that could be used for water use below a specified threshold, or in specified circumstances. As mentioned above, currently the thresholds for exemptions from permits are extremely low, in many cases being set so as to only allow manual water abstraction (see Table 1). If other tools are available to regulate water use, the thresholds for requiring permits can be set at a higher level. Two key tools other than permits are discussed in the following sections: 'general rules', and customary law. If such tools are to be used, it is important that they have at least an equal legal standing with permits and that water users are aware of this. This is in order to make sure that smaller-scale water users are not discriminated against by the nature of the tool used. Equally, such tools should be acceptable as collateral for loans in the same manner as permits.

Use of general authorisations

In South Africa, the National Water Act of 1998 includes the option of *General Authorisations*, in which small-scale or defined uses from a specified water source can be authorised under general rules or conditions, although implementation of this tool has been restricted to authorising very small volumes only (2000 m³ of surface water per year per user in stressed basins). Formal options to exempt low impact users from permitting and to regulate them under general rules exist in other legislation as well, but have not been used (van Koppen and Schreiner 2018). The application of general authorisations would allow conditions to be set for such water uses, for example prohibiting pollution, as well as specifying conditions for water use during periods of limited water availability. Access under customary arrangements could also be made secure through General Authorisations.

Harnessing customary water law

A vital tool in hybrid water use authorisation is the recognition of customary water law with an equal legal standing to permits. This recognition of legal pluralism is the obvious starting point for land tenure systems in Africa. However, plural water law has been insufficiently addressed even though African rural societies where customary land tenure is fully recognised constitute greater proportions of the population than in the settings where these debates have been high on the policy agenda such as in Latin America (Boelens, 2008) or the USA, Canada, or New Zealand (Jackson, 2018). In these regions, scholars and activists have highlighted the need to recognise the co-existence of statutory and customary (or indigenous) water law, and have exposed the colonial origins of statutory permit systems (Boelens, 2008; Vera Delgado and Zwarteveen, 2014). Debates about the practical implications of this coexistence of different legal systems do, however, warn of the complexities of formal, statutory 'recognition' of customary law, as already seen above for 'recognition' in colonial law. Also, gender and other social hierarchies in customary arrangements can contradict constitutional rights, and need to be transformed.

A first step for scholars and water authorities towards the recognition and use of customary arrangements to solve conflicts for example, is to better understand the socio-institutional customary arrangements that underpin existing incentives for investments or conflict-resolution arrangements. One way to fill this knowledge gap is by identifying the principles or grounds that (segments of) communities invoke to justify their claims to water and that are related to an authority structure. In any local context, the negotiated normative outcome of the negotiations within customary systems is a blend of these grounds. The following illustrates this approach.

Focusing on indigenous irrigation in Latin America, Boelens and Vos (2014) identified five principles that are equally found in case studies on customary water law in sub-Saharan Africa (Ramazotti, 1996; van Koppen et al., 2007; Komakech, 2013). These are: socio-territorial rights, investors' claims or hydraulic property rights, first-come-first-served, transfers and power. A sixth principle that emerges

based on a literature review on Africa is that water is seen as given by god, and a resource that should be shared by all humans and animals. This holds for any water available from multiple sources and infrastructure. The notion of exclusive claims to water is alien in customary arrangements. As the Boran in Ethiopia hold: "Water is either a source that you 'share in' as a member of a descent based collective, or one that you 'share out' to signify respect" (Dahl and Megerssa, 1990, cited in Ramazotti, 1996: 91). This fair and inclusive principle that one cannot deny 'reasonable use' to others is even observed in households with self-financed homestead wells or boreholes. They can be morally obliged to allow neighbours to take water. This principle aligns with the formally declared human and constitutional rights to water for basic needs (Derman et al., 2007).

There are remarkable similarities between Latin American and African literature for the other five principles. Socio-territorial claims are based on the physical link between land and water that shapes settlement patterns and customary tribal authority structures: right holders to land claim rights to water sources flowing over or under their land. Access points and servitudes are particularly regulated. For pastoralist communities, water availability and pastures are closely linked to their 'moving' land tenure systems. In upstream-downstream conflicts, socio-territorial claims may be weaker than the claim that water is a shared resource. The principle of hydraulic property rights creation implies that those groups or individuals who invest in infrastructure and its maintenance have priority rights to the water stored and conveyed (Coward, 1986; van Koppen et al., 2007; Komakech, 2013; Boelens and Vos, 2014). The internal distribution of water in communal schemes can follow many sharing arrangements. The security of reaping the deferred benefits from investments drives FLID. When the expansion of FLID creates new forms of competition for water resources, the principle of water as a shared resource can inform new local dispute resolution arrangements (Komakech, 2013). The principle of first-come-first-served is reflected in ancestral claims to land and related water resources. Earlier investments in infrastructure remain an argument for claiming rights to water resources vis-à-vis later investors. Rights to water can also be obtained by transfers from other right holders, in particular through kinship relations of marriage and inheritance, or through donation, sale, exchange or barter. Vendors, irrigation water markets and pump rental markets are other forms of transfers. Last, and unfortunately not least, claims to water and land can also be determined through violence and coercion. Power relations perpetuate gender, age and other social hierarchies in water entitlements. As these contradict constitutional rights, states are the duty bearers to expose and address these contradictions.

Robust evidence-based action research on how farmer-led irrigation development is shaped by customary water law principles and how a pro-poor hybrid water legislation can help secure these practices is needed. Current insights into customary water law in Africa only scratch the surface. Researchers and water officials need to move beyond incidental case studies or undocumented actions by local officials who already engage with customary arrangements in order to solve water conflicts.

PRIORITISATION

When water uses that are authorised under different tools have equal legal standing, prioritisation in water allocation processes should be used by the state to ensure that water use serves national development objectives, and that the needs of small-scale farmers for water are recognised as a priority to be addressed. This includes clear priorities in terms of who receives water and who is curtailed during times of water shortage. Prioritisation should follow a normative framework in line with national development goals. Such prioritisation would apply to permit-holders and other water users alike. The option of prioritisation exists in current legislation, but is embarrassingly rudimentary and seldom applied. Generally, prioritisation refers, at best, to monolithic single-use sectors, without any consideration of intra-sectoral differences, people's multiple water needs in rural economies, or local conditions. Across sub-Saharan Africa, goals typically include meeting constitutional rights, poverty

alleviation and broad-based agricultural and economic growth, which would include farmer-led irrigation development.

Prioritisation in South Africa's National Water Resource Strategy 2nd edition attempted to address this. The first priority is given to the ecological and (domestic) basic human needs reserve, followed by water to meet international obligations. Third priority is then given to "the allocation of water for poverty eradication, the improvement of livelihoods of the poor and the marginalised, and uses that will contribute to greater racial and gender equity" (DWA, 2013: 47). Significantly, such water uses are given a higher priority than water allocation to the important fourth priority: strategic uses, which is primarily for the country's main source of energy from coal-fired electricity generation. Permitted water use for other economic purposes comes in the fifth place. Like much of South Africa's exemplary policies, this prioritisation is still to be applied in practice. Providing for basic water and food needs is part of constitutional commitments by states as duty bearers. In addition to the high priority already allocated to water for basic domestic needs, constitutional commitments imply the highest priority being allocated for water that meets basic productive needs by people who are dependent on growing at least a portion, if not the entirety, of their food needs, or on growing sufficient crops to bring in money to buy food. The UN Commission on Economic, Social and Cultural Rights, in its General Comment 15 on the human right to water, and other global actors, increasingly interpret the substantive human right to water to include water to realise the right to food (Hellum et al., 2015; HLPE, 2015).

CONCLUSIONS

In sum, when all water users (except those using hand tools to abstract very small amounts of water) were obliged to get a water permit after independence this may have looked like equal treatment after an era in which water resources were formally owned by colonial powers and permits were limited to settlers only. However, the post-independence water legislation continued to override customary water law and perpetuated a system of discrimination by default. Instead of simple permits for a small number of settlers, the delivery and monitoring of much more complex permits across many more water abstractors has indeed become logistically impossible. These implementation challenges not only bring to the fore how monolithic permit systems criminalise and marginalise small- and micro-scale water users but also how they are to the detriment of state resources and credibility (Lund and Eilenberg, 2017). Under current systems, unpermitted water use by small-scale users is illegal even though this is mostly because of the inability of the states to implement permit systems. In addition to possible (if seldom taken) action by the state, this means that they have no legal recourse to protect their water use in the face of increasing competition.

The hybrid approach provides a suite of tools and ensures that the water use of small-scale users has a legal status that is equal to, or has a priority status over, permits. Targeting permits to regulate the relatively few high-impact users formalises what most water authorities are already doing formally or in practice. Due process in the assessment of new high impact water use applications and the enforcement of permit conditions can protect smaller water users governed by customary water law or other legal tools. Some of the tools referred to in this viewpoint are already partially mentioned in current legislation, some may require more systematic application or elaboration in regulations or amendments. What emerged from the above-mentioned policy dialogue is that the refinement and implementation of a hybrid approach to water use authorisation will create a legal system implementable within the capacity constraints of African governments, and that will protect the use of water by small-scale farmers, assist in realising people's constitutional rights to water and food, and improve delivery on national goals of poverty alleviation and food security through offering legal protection to the water use of those farmers driving the small-scale FLID revolution in Africa.

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REFERENCES

- Boelens, R. 2008. The rules of the game and the game of the rules. Normalization and resistance in Andean water control. PhD thesis. Wageningen, Netherlands: Wageningen University.
- Boelens, R. and Vos, J. 2014. Legal pluralism, hydraulic property creation and sustainability: The materialized nature of water rights in user-managed systems. *Current Opinion in Environmental Sustainability* 11: 55-62.
- DWA (Department of Water Affairs), Republic of South Africa. 2013. National Water Resource Strategy Second Edition: Water for an Equitable and Sustainable Future. Pretoria: Department of Water Affairs.
- Derman, B.; Hellum, A.; Manzungu, E.; Sithole, P. and Machiridza, R. 2007. Intersections of law, human rights and water management in Zimbabwe: Implications for rural livelihoods. In van Koppen, B.; Giordano, M. and Butterworth, J. (Eds), 2007. *Community-based water law and water resource management reform in developing countries*, pp. 248-269. Chapter 15. Comprehensive Assessment of Water Management in Agriculture Series 5. Wallingford, UK: CABI Publishers
- Giordano, M.; de Fraiture, C.; Weight, E. and van der Blik, J. (Eds). 2012. Water for wealth and food security: Supporting farmer-driven investments in agricultural water management. Synthesis report of the AgWater Solutions Project. Colombo, Sri Lanka: International Water Management Institute (IWMI).
- Hellum, A.; Kameri Mbote, P. and van Koppen, B. (Eds). 2015. *Water is life: Women's human rights in national and local water governance in Southern and Eastern Africa*. Harare: Weaver Press.
- HLPE (High Level Panel of Experts). 2015. Water for food security and nutrition. A report by the high level panel of experts on food security and nutrition of the committee on world food security. Rome, Italy: High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security.
- Jackson, S. 2018. Indigenous peoples and water justice in a globalizing world. In Conca and Weinthal (Eds), *The Oxford handbook of water politics and policy*. Chapter 6. New York: Oxford University Press.
- Komakech, H. 2013. *Emergence and evolution of endogenous water institutions in an African Basin. Local water governance and state intervention in the Pangani River Basin, Tanzania*. PhD thesis, Delft University of Technology. Leiden: CRC Press/Balkema.
- Lund, C. and Eilenberg, M. 2017. *Rule and rupture: State formation through the production of property and citizenship*. Policy Brief No. 02/2017. Copenhagen Centre for Development Research, Department of Food and Resource Economics, Faculty of Science, University of Copenhagen.
- Ramazotti, M. 1996. *Readings in African customary water law*. FAO Legislative Study No. 58. Rome: Development Law Service, Food and Agriculture Organization of the United Nations (FAO).
- Schreiner, B. and van Koppen, B. 2018. *Establishing hybrid water use right systems in sub-Saharan Africa. A practical guide for managers*. Pretoria: Pegasys Institute and International Water Management Institute.

- Shurie, M.; Mwaniki, B. and Kameri-Mbote, P. 2017. Kenya water permit systems. Water permit systems, policy reforms and implications for equity in Kenya. REACH Project Country Report 2016/2017. A project country report submitted to Pegasys Institute and the International Water Management Institute. Pretoria: Pegasys Institute, the International Water Management Institute, Kenya Water Resources Management Authority, and the University of Nairobi.
- van Koppen, B.; Giordano, M. and Butterworth, J. (Eds). 2007. *Community-based water law and water resource management reform in developing countries*. Comprehensive Assessment of Water Management in Agriculture Series 5. Wallingford, UK: CABI Publishers.
- van Koppen, B.; Nhamo, L.; Cai, X.; Gabriel, M.J.; Sekgala, M.; Shikwambana, S.; Tshikolomo, K.; Nevhutanda, S.; Matlala, B. and Manyama, D. 2017. *Smallholder irrigation schemes in the Limpopo Province, South Africa*. IWMI Working Paper No. 174. Colombo, Sri Lanka: International Water Management Institute.
www.iwmi.cgiar.org/Publications/Working_Papers/working/wor174.pdf
- van Koppen, B. and Schreiner, B. 2018. A hybrid approach to decolonize formal water law in Africa. IWMI Research Report No. 173. Colombo, Sri Lanka: International Water Management Institute (IWMI) and Pegasys Institute.
- Vera Delgado, J. and Zwarteveen, M. 2017. Queering engineers? Using history to re-think the associations between masculinity and irrigation engineering in Peru. *Engineering Studies* 9(2): 140-160.
- Vilanculos, A. and Macuacua, E. 2010. Quantitative analysis of water demand and supply in the Lower Limpopo. In Van der Zaag (Ed), *What role of law in promoting and protecting the productive uses of water by smallholder farmers in Mozambique?*, pp. 31-40. Monograph Mozambique of the project Water Rights in Informal Economies (CP 66). Delft, UNESCO-IHE Institute for Water Education, and Water Resources Section, Delft University of Technology and Colombo: Challenge Program on Water and Food.
- Woodhouse, P.; Veldwisch, G.J.; Venot, J.-P.; Brockington, D.; Komakech, H. and Manjichi, A. 2017. African farmer-led irrigation development: Re-framing agricultural policy and investment? *The Journal of Peasant Studies* 44(1): 213-233.
- WRMA (Water Resources Management Authority). 2007. *Water resources allocation thresholds for classification of permits*. Kenya: Water Resources Management Authority, 2007.
- World Bank. 2018. Innovation, entrepreneurship, positive change. Join the farmer-led irrigation revolution. Feature story 5 September 2018.
www.worldbank.org/en/news/feature/2018/09/05/innovation-entrepreneurship-positive-change-join-the-farmer-led-irrigation-revolution

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