WATER MARKETS IN SOUTH AFRICA: ARE THEY WORKING OR WILL THEY WORK?

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ABSTRACT: Water markets have developed in 1980s on the back of climate change, rapid population growth and the expansion of irrigated agriculture, which have increased water scarcity around the world. Africa and South Africa in particular is no exception. Driven by the need to explore measures that are economically efficient in managing water demand, this study explores the relevance of water markets in South Africa. What makes water markets work is particularly explored here in brief and discussed whether these favourable conditions exist in South Africa. A schematic institutional framework/model is suggested based on review of past studies. The model is sufficiently generalised and can explain water market phenomena in various situations. An assessment is made whether these water markets are working efficiently or will they work in the future in South African context.

KEY WORDS: Water market, demand management, property rights, regulation, transaction cost.

JEL Classification: Q15, Q25

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1.0 INTRODUCTION

Water markets are now considered an alternative to the original centralized approach to water management and it is believed that a perfect centralized planner does not exist. The centralized water management planning has given rise to a number of problems such as the under-pricing of water and consequent wasteful use and inequality in the allocation, poorly planned water projects, and political interference leading to corruption (Holden and Thobani, 1996; Mohanty and Gupta, 2002). Water markets are viewed as a policy tool for addressing water quality problems (Weinberg et al. 1993). As a result, they have emerged as an alternative to centralized water management approach to achieve the goal of sustainable and efficient water use in the society (Mullins et al., 2004). Theoretically speaking, the water marketing phenomenon occurs when the exchange of water rights between different uses occur, and this results into transfer of water rights from lower to higher value users (Pott et al., 2005).

Water markets are believed to increase the efficiency of water use and thereby resultant distribution of wealth (Brookshire et al., 2004). The assumption of zero transaction cost of transferring water rights would allow the trade until the marginal value of rights equals across different uses (Hearne and Easter, 1995). A standard argument that economists in general offer is that water is under-priced because it is treated as a social good, rather than an economic good alone (Mohanty and Gupta, 2002). For example, in South Africa, irrigation water in 1980s was priced at only about 30 percent of the operation and maintenance costs (Anderson and Landry, 2002). Water markets allow the water to be priced at its opportunity costs through interaction between demand and supply forces. The opportunity cost of water reflects the scarcity of water and hence ensures the best use

of water. Water users in the society assess the opportunity cost and transactions costs of trade and, if the expected benefits from acquiring water exceed the costs (opportunity plus transaction costs), then water trading takes place.

Transaction costs are as important as opportunity costs and they include the costs of the physical infrastructure required to transfer and measure the water; the costs of obtaining trade information, finding trading partners and making trade agreements, and the legal and administrative requirements such as validity and regulating the deal (Hearne and Easter, 1995; Mohanty and Gupta, 2002; Nieuwoudt et al., 2008). Transaction costs are major determinant in the development of water markets. Since transaction costs had to be internalized and covered by either buyer or the seller of water rights, it is important that the costs are small so that a water market may emerge; minimizing transaction costs is the main objective to increase the trade and permit efficiency in water use (Brookshire et al., 2004; Easter et al., 1999; Mohanty and Gupta, 2002). The other factor that added to transaction costs is the presence of uncertainty in the market. Uncertainty can arise from ambiguous and poorly defined entrenched and communicated regulation (Holden and Thobani, 1996; Marino and Kemper, 1999).

The water management based on market forces will enforce opportunity cost pricing and is believed to provide better and more pragmatic solutions in water use (Brookshire et al., 2004; Holden and Thobani, 1996; Lee, 1999). However, it is believed that such water market (based on market forces) may have serious adverse effect on the users in terms of high prices (Danilov-Danilyan et al., 2015). In a bid to the resolve the problem of under-pricing, inefficient water use as well as inequality in the allocation, availability of water resources at a just and reasonable price should be considered.

Despite the increasing recognition of water markets as an efficient way of allocating water, there exists limited scholarly evidence on this issue in the South African context. In a bid to bridge this empirical gap, the major objective of this study is to assess the significance of water markets in general in resolving the water management issues with reference to the South African situation, especially with respect to reducing the transaction costs associated with trade and uncertainly in the market. South Africa is in the midst of a water crisis and at the time of writing, the volume of water in most dams across the country is below normal levels. Dams in Limpopo, North West and the Eastern Cape are at a lower capacity, around 70%, whilst dams in the other provinces at the

81% average which 19% below full capacity (DWAF, 2016). In isolated cases, such as Middle Letaba, there are serious shortages affecting domestic demand. According to the DWAF (2016), there is a 98% assurance level which suggests that any peaks in future demand will result in demand exceeding supply and this is a source of vulnerability that needs to be addressed. At the same time, the shortage of water supply has erupted against a background of increasing water demand emanating from three main factors. The first is the recurrence of droughts that has reduced the reliance on rain-fed agriculture and increased the prominence of irrigated agriculture in remote parts of the country. The second is the rapid population growth which implies increased water consumption and therefore demand; while the third factor relates to the rapid expansion of industries that heavily consume water in the production process.

Continuing to cope with this growing water demand, augmenting the supply for future water demand has become a real challenge to urban water supply authorities. This challenge is exacerbated by various supply- and demand-side factors such as ever increasing scarcity of water caused by depletion and degradation of water resources, unequal distribution of rainfall due to climate variation, steep increase in water demand due to rapid urbanization In light of these factors, there is need for a probe into the relevance and potential of water markets to allocate the scarce water in the most efficient way.

To date much of related literature on water markets has had two key focuses: 1) theoretical underpinnings of water markets and 2) empirical analysis of existing water markets. The theoretical focus can be traced back to Johnson and Gisser (1981) and Vaux and Howitt (1984). Recent theoretical studies are due to Grafton et al. (2011) and Janmaat (2011). This strand of literature has focused on the potential welfare gains of water markets for market users and possible limitations to market transactions such as third party effects, transaction costs and legal constraints. Empirical efforts (Basta and Colby, 2010 and De Mouche et al. 2011 for instance) have been made to analyse the existing water market structure highlighting central challenges such as transactional costs and price setting by an administrator which inhibit their successful implementation. The present study adds empirical evidence on water markets by exploring their relevance and potential in solving the ongoing mismatch between water demand and water supply in South Africa. It seeks to gain insights as to how water markets in South Africa can be made effective in light of the water problems facing the country.

The discussion here is arranged as follows: Section 2 covers a brief review of some salient water markets in the world which were considered relevant to South Africa. A model of water market is outlined in Section 3. Water markets in South Africa are briefly discussed in Section 4. Policy intervention strategy is covered in Section 5, followed by summary and conclusion in Section 6.

2.0 SOME SALIENT WATER MAREKTS OF THE WORLD

The whole world is currently faced with water scarcity (Deng at al., 2017). According to the United Nations, roughly 0.46 billion people live in highly stressed water-use areas; one quarter of global population faces water shortages and this proportion is expected to reach two thirds by 2025 (UNWATER, 2007). The water crisis is seriously impacting sustainable development of human beings at the same time human activities influence the stability and development of the water resources system (Bekchanov et al., 2015). This, combined with other factors such as droughts, rapid population growth and the expansion of irrigated agriculture, water markets have become more prevalent around the world (Grafton et al. 2011; Grafton et al., 2013). Here a brief review of them in some selected countries is provided and it covers particular countries that include Chile, Australia, USA and India.

Chile is a water scarce country like South Africa. A new water code was implemented in 1981; this permitted defining of water rights as permanent or contingent and consumptive and non-consumptive. Permanent rights are defined as rights to exhausted supplies and contingents are right to excess water in times of high flow (Olmstead, 2010). Similarly consumptive rights are granted upon when water is fully used while non-consumptive rights refers to the situation when water is returned to the original source at a stipulated quality (Hearne and Easter, 1995). Permanent water rights are granted with no requirement to specify the reason for use (i.e. beneficial use requirement clause is not attached to the water right). The lack of beneficial use clause has led to the sub-optimal use of water trading. Transaction costs are relatively high leading to not so well progressed water markets in Chile (Grafton et al., 2011).

Australia is faced with acute water demand due to the fact that it occupies the driest continent and as well consumes much water (Danilov-Danilyan et al., 2015). In Australia the water markets were introduced in 1994 by the Australian National Water Commission. Water entitlements are granted to water users and their entitlements are transferable after due approval by the Water Commission provided they do not have negative environmental or third party effects. The entitlements are constrained to a number of constraints (which includes the reliability of the water supply, tradability and the period of the license) and make it a very complex (Shi, 2005). The uncertainty with respect to security of rights and information availability has given rise to increasing transaction costs.

In the United States, the water market in Northern Colorado is cited as the best example of a near ideal water market. The water allocations were made tradable in 1960 (Marino and Kemper, 1999). The water is owned by the US government but Northern Colorado water conservancy District (NCWCD) is granted perpetual rights. The water allotments are allocated on the basis of needs, ability to make it for beneficial use and that its usage does not have any adverse effect on other users (Nieuwoudt, 2000). Information costs are brought down by the pressure of so-called "ditch companies "which play the role of information gathering and distribution.

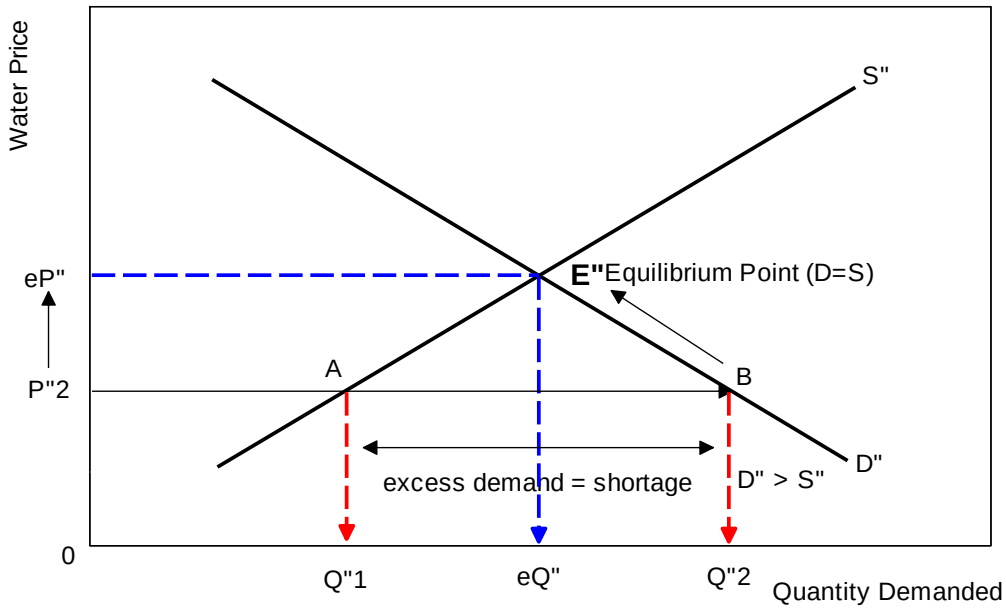
The water markets have also come up in India, particularly in Gujarat state of India. Gujarat is faced with problem of scarcity due to the 1999-2000 droughts, limited fresh water coupled with increased demand by different sectors (Fayolle and Jaubert, 2009; Kumar and Singh, 2001). Water use in most part of the state is inefficient and unsustainable particularly irrigation- the largest water use in the state. In Gujarat, surface water is regulated by the 1879 "Bombay Irrigation Act" conferring to the state a sovereign right upon surface water and allowing government agencies to develop and manage irrigation schemes (Fayolle and Jaubert, 2009).

At the outset, water use efficiency is critical taking into account the increasing demand for water in industries as well as crop production (Wang et al., 2017). In arid and semi-arid regions of the world, agriculture relies heavily on irrigation of water diverted from rivers and the recurrent droughts can have significant negative impacts on rural livelihoods that depend on agriculture. Meanwhile, increasing water needs for industrial, domestic and environmental uses have led to water scarcity globally. On this point, the World Health Organization recently estimated that at the global level around 780 million people have no access to clean drinking water and around 2.5

billion do not have adequate sanitation (Source:.) Against this background of growing water demand, it is increasingly being acknowledged that the centralized water management planning has given rise to a number of problems such as the under-pricing of water (Holden and Thobani, 1996; Mohanty and Gupta, 2002). Water markets easily avert this under-pricing problem by setting the price where water demand equates water supply. Figure 1 demonstrates this mechanism.

D" and S" represent the demand curve and supply curve respectively, P denotes water price while Q is the quantity demanded of water. Also, eQ and eP are equilibrium quantity demanded and equilibrium price respectively. The growing demand for water on the back of limited water supply implies an under-pricing at point P"2 where the quantity demanded exceeds the quantity of water supply. This price is way below the equilibrium price (eP") hence the centralized water management strategy that often responds to such water shortage or excess demand cases by rationing water use without price adjustment often lead to the under-pricing problem (P"2<eP"). In the absence of the central planner, the market forces will act in such a way that raises the water price from a point of disequilibrium A and B up to point E" where the quantity demanded matches the water supplied giving rise to a new optimal price Ep". This equilibrium price is more efficient than what the centralized planner would have maintained in most cases as it ensures neither excess demand nor excess supply of water in the market.

Thus unlike the centralized planner introducing water rationing at a disequilibrium price level, the water market model ensures that market participants will respond to the rising water price by reducing not demand but their quantity demanded until a level where the quantity of water suppliers are willing to supply is equal to the quantity of water consumers are willing to purchase and consume. The new equilibrium price eP" which is higher than the initial price P"2 therefore demonstrates an argument raised by Danilov-Danilyan et al. (2015) that water market (based on market forces) may have serious adverse effect on the users in terms of high prices. Notwithstanding this argument, this new price is optimal in the sense of correcting the market disequilibrium where water demand exceeds water supply.



Source: Author's computation using E-views 9

Figure 1: Water Demand and Supply – the Under-pricing Problem

3.0 WHAT MAKES WATER MARKETS WORK: A MODEL

The primary objective in the management and development of water markets is to reduce transaction costs and increase certainty in the system so that water markets can function efficiently. It is envisaged that the development of water markets entails three basic things: (1) Existence of scarcity --water markets are successful in areas where water is scarce. (2) Structure of ownership of water and property rights to water are well-defined or delineated. (3) Regulatory aspects of rights are conducive to functioning of water markets (Figure 2). These three conditions are elaborated below.

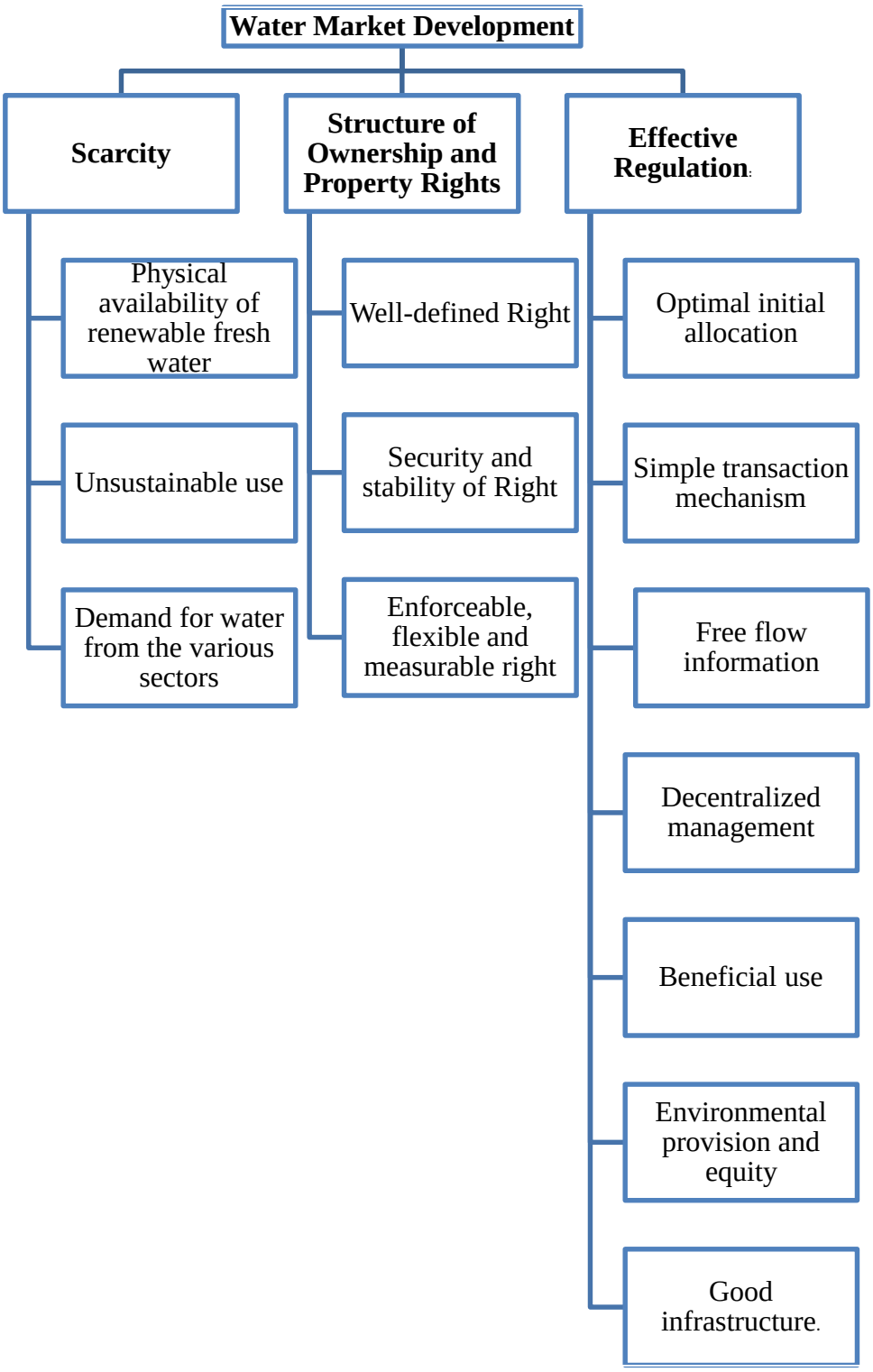


Figure 2: Essentials of Efficient Water Market

Existence of Scarcity: Water scarcity can be analysed from three points of view namely: (1) Physical availability of renewable fresh water; (2) Unsustainable use of water; and (3) Demand for water from the various sectors (Kumar and Singh, 2001). The existence of water markets depends upon the scarcity of water. Water markets are effective where water is scarce (Easter et al., 1999). The experience of Chile, Colorado and India confirms it (Marino and Kemper, 1999). In South Africa, the problem of water scarcity is created by the increasing global warming and recurrent droughts which warrants an efficient use of water. The scarcity of water is also a result of increasing demand for water in other key economic sectors like agriculture (Peterson et al. 2004). These experiences necessitate formation of water markets which have the potential of allocating the scarce water in the most efficient way.

Structure of Ownership and Property Rights: Traditionally speaking, water is treated as a public good and hence it cannot be owned by individuals or corporations (Marino and Kemper, 1999). The inefficiency of these water allocation mechanisms is however well documented (Colby 1990b). In addition, the pre-held notion that water cannot be traded is faulty as rights to use resources or water is tradable (Hearne and Easter, 1995). Chile, which was the first country to introduce a comprehensive water law, established a system of tradable property rights, beginning in 1976. Mexico followed suit in December 1992 by passing a water law that recognized the transferability of water through water rights. These experiences mean that what we need are specifications of property rights with respect to water use. These rights should be well-defined; secure and stable; enforceable; flexible and measurable.

(i) *Well-Defined Rights***:** Water markets require rights to be well and clearly defined and the mechanisms to facilitate and monitor water trade ought to be established. The manner in which property rights are defined determines the incentives and disincentives which water users will have to face in their decisions to own, use and transfer water. The well-defined property rights exhibit a variety of property characteristics that make the resource amenable to efficient use. These characteristics include the following characters of the property secure, enforceable, measurable and flexible. The water

rights are turned on well-defined when the volume, reliability, quality and durations are explicitly stated and clearly understood (Mullins et al., 2004).

The volume refers to the quantity or magnitude of water; the reliability entails the assurance of supply varying with water sources and uses; tradability deals with the rules which facilitate transfer and to mitigate any third party effects. The rights are not granted forever; hence then duration and frequency with which they are reviewed and be specified as well. The definition of rights can vary from one region to other as per location specific needs and regulations. However, whatever may be the definition, it should be clearly understood by users. Otherwise it can lead to conflict between users, and leading to the increasing transaction cost of the trade (Holden and Thobani, 1996). Furthermore, water rights should be separated from land right which allows them to be flexible and easily transferable from one user to other user (Easter et al., 1999; Mullins et al., 2004).

(ii) *Security and Stability of Rights***:** Security is defined as "ability to identify and gain protections for the right of use" (Pott et al., 2005). Stability entails that right to resource use is guaranteed into the future. A right is secured and stable if anyone intrigues. The long-term security and stability of water rights promotes investment in water conservation (Solanes and Gonzalez-Villareal, 1999).

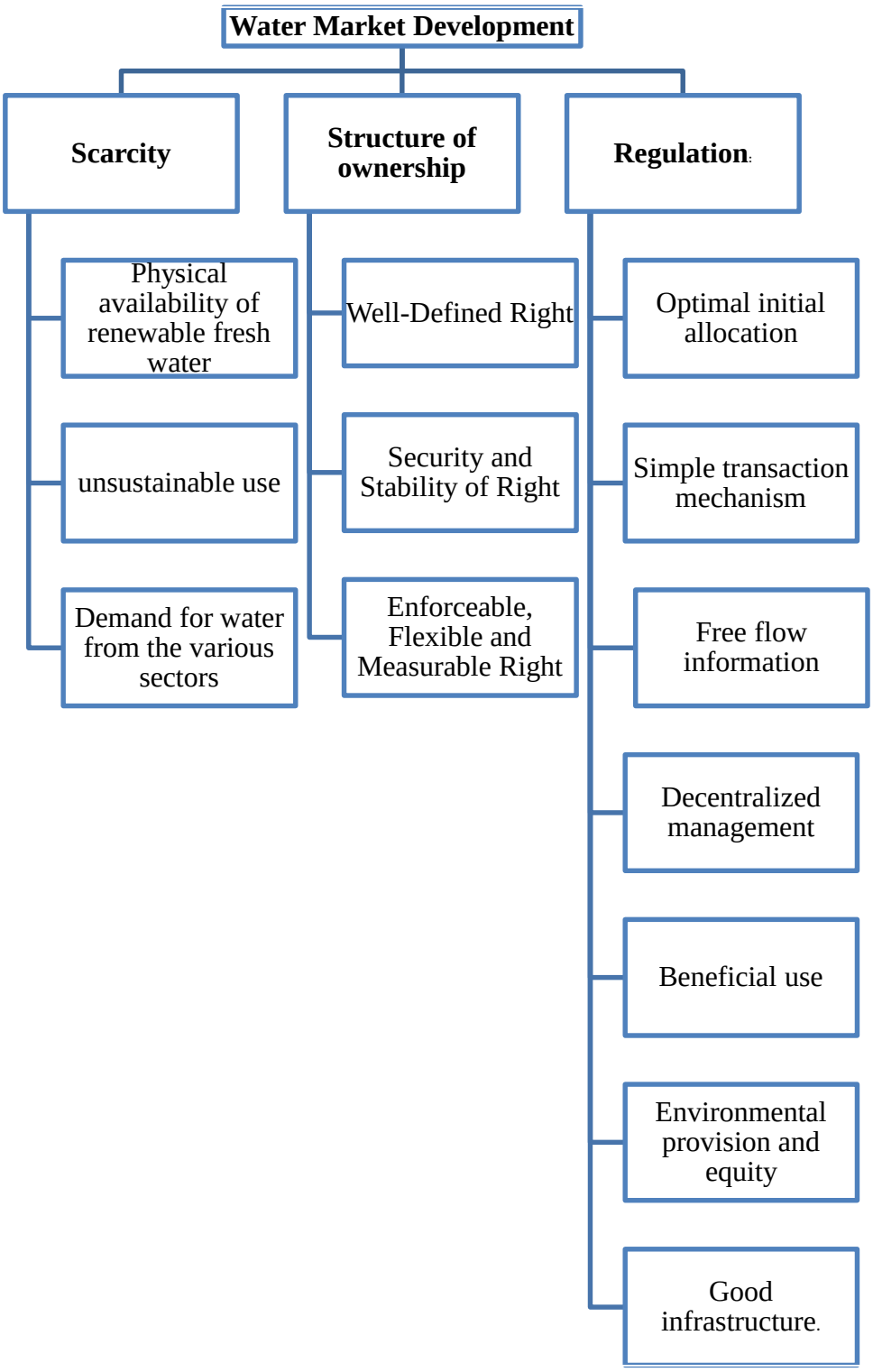


Figure 2: Essentials of Efficient Water Market

(iii) *Enforceable, Flexible, and Measurable Rights***:** The strength of property rights defends upon the efficiency of enforceability (Mullins et al., 2004). A poorly enforced property right will not allow accrual of full benefits to the property right holders and hence creates a disincentive. Flexibility of rights refers for different uses (Pott et al., 2005). The flexibility allows water rights to be used for various purposes and thus gives a larger market of buyers to the right holder (Nieuwoudt, 2000). Measurability of water rights ensures control on water flows or volume that are purchased or sold. Inaccurate measurability will dis-incentivize potential water traders to be unwilling to purchase unregulated rights (Hearne and Easter, 1995).

Effective Regulation: The third important part of developing water markets is the effective regulation. The effective regulation finally impacts the right holder's behaviour. Some bare minimum essentials of regulation are as follows:

(i) *Rule 1: An optimal initial allocation*

Initial allocation of water rights should be equitable. Under the perfectly competitive conditions, which are characterized by perfect information, no transaction cost and freely transferable water rights, the final allocation will be identical despite how the initial allocation is allotted. Given that ideal conditions do not prevail, the initial distribution of water rights plays an important role in determining how the final equilibrium will come about (Lee, 1999). Real world situations entail market power, externalists due to transfers of right and costly activities of acquiring information, contracting and enforcing. Initial allocation of water right requires recognition of historical users of water and thus avoids opposition. The historical recognition is essential pre-requisite. However, any water rights available from new dam or more efficient use of water could be auctioned off as was the case in Australia, Chile and Western US.

(ii) Rule 2: Simple Transaction Mechanism

The transfer rights should be simple and must embody the concepts of transparency and reliability so as to secure the fruit of water users in the system (Hearne and Easter, 1995). Also, time and financial costs of transfer should be minimized because high cost impedes proper market functioning (Mentor, 2001).

(iii) Rule 3: Free flow Information

Free flow of information between water users is essential for redelivering uncertainty in their minerals. The following set of information should be shared: prices, trading partners, water availability and regulatory charges.

(iv) Rule 4: Decentralized Management

The water users should play a central role in the management of research. Many countries have implemented it by establishing management agencies. For example, Water Users Associations (WUAs) in Chile have played important role in facilitating water trade (Hearne and Easter, 1995). The WUAs reduce transaction costs of water trades by efficient communication. The establishment of decentralized regulatory bodies does not obviate the need for central authenticity. The central regulation is needed to protect against monopoly development, third-party impacts and to resolve conflicts relatively to the definition and enforcement of water rights (Armitage, 1999). In brief, a combination of water market forces and government regulation are required to efficiently allocate water resources (Freebairn, 2004).

(v) Rule 5: Beneficial Use

The absence of beneficial use clause in Water Code in Chile led to the development of sub-optimal water markets as users held water rights for speculative uses (Mohanty and Gupta, 2002). The

beneficial use clause is considered essential element of water market for allocating water efficiently.

(vi) Rule 6: Provision for Environment and Equity

Regulation should make enough provisions to protect environment and equity objectives. Generally speaking, these can be handled by the government through non-market mechanisms.

(vii) Rule 7: Good Infrastructure

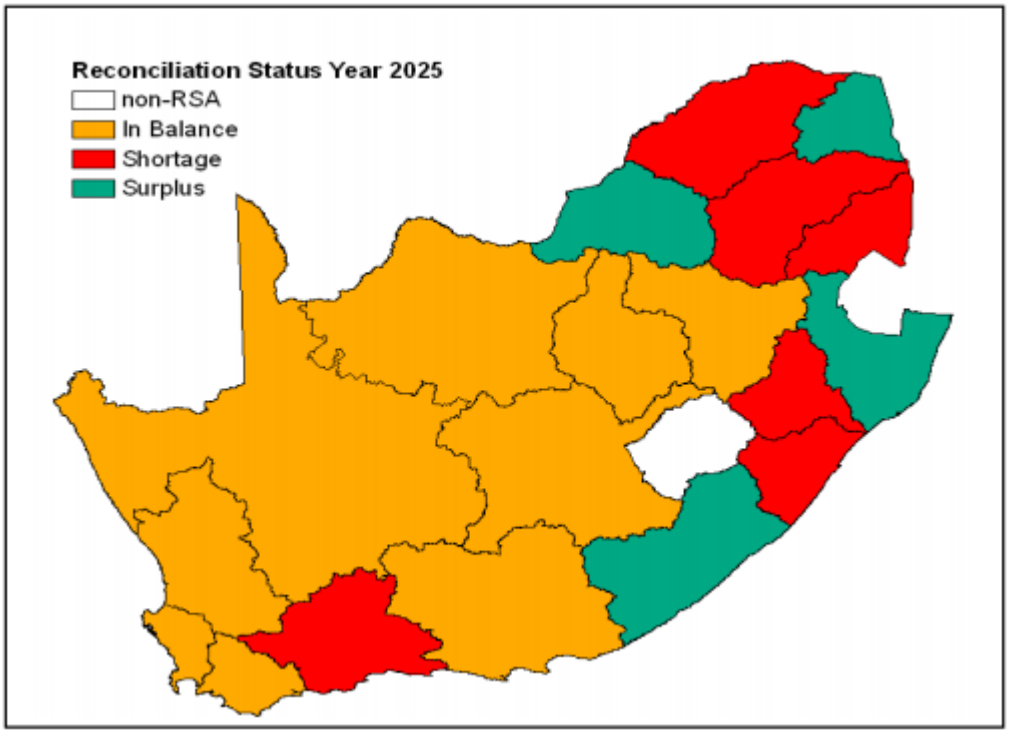
A good water infrastructure helps the water market to grow. For example, in Chile, the existence of reservoirs and short canals flowing from rivers lowered the transaction costs of trade (Hearne and Easter, 1995). Water markets function best when storage dams and physical infrastructure to transfer water exists, although it is not an essential requirement (Armitage, 1999).

4.0 WATER MARKETS IN SOUTH AFRICA

South Africa being part of the world trend is also faced with the need to re-evaluate the management of water use (Saleth and Dinar, 1999). Climate change, a growing population coupled with persistent droughts continue to present water managers with challenges in allocating scarcer water resources. Throughout South Africa, water managers are confronted by challenges in fulfilling existing water demands due to the already mentioned factors of droughts, climate variability, population growth and shifting water demands (Tewari, 2009). In the past two decades, South Africa's population has almost doubled from just over 35 million in 1994 to near 55 million in 2015(Source) -- a situation that has continued to place immense pressure on water utilities in all parts of the country.

In most parts of the country owing to the scarcity of water and growing water demand, households typically receive water for a few hours a day and in insufficient quantities. Consumers typically

supplement piped water with water from private wells and tankers. Figure 3, which is a supply-demand scenario for 2025 in South Africa, illustrates that shortages will become more prevalent if proper attention is not given to providing more water. South Africa's projected water supply-demand scenarios are computed by the Department of Water Affairs and Forestry (DWAF). In general the scenario displayed in Figure 4 clearly indicates that problems of water scarcity are likely to persist and that the country will be more likely to experience water shortages than surpluses by 2025.



Source: DWAF (2016)

Figure 3: 2025 Water Demand and Supply Scenario in South Africa

The good news however is that the Department of Water Affairs and Forestry (DWAF) has embarked upon a process to develop a framework that will set in motion a course of action to ensure that there is sufficient water, in both quantitative and qualitative terms, to support South Africa's path of growth and development. The Department has also embarked upon rigorous water

assessment studies referred to as Reconciliation Strategies in order to achieve the reconciliation of supply and demand for both water scarce areas as well as those experiencing relatively high levels of demand (Source). These strategies aim to ensure the supply of water at adequate levels of assurance within the constraints of affordability and appropriate levels of service to users and protection of current and possible future water resources.

Water scarcity has been identified in the major urban centres. These major urban areas anchor the country's economy, and therefore failure to avert serious water shortages could impact adversely the entire economy. It is widely acknowledged that water is a scarce and valuable resource, which is both a social and economic good supporting all facets of human life.

Against the above background, the emergence of water markets that facilitate the transfer of water rights has been one institution that has provided water managers with the ability to realign water rights as a measure of coping with potential water challenges. The National Water Policy for South Africa states that all water in the water cycle will be treated as part of the common resource and this necessitates the development of a legal framework for optimal water resource management (DWAF, 1998). Due to public ownership of water, right to use certain volume of water is granted through an allocation process which is relative in terms of quantity, quality and time of use (Nieuwoudt et al., 2008). The characteristics of the South African water market are outlined in Table 1.

Table 1: Characteristics of South African Water Market

	Particulars	Characteristics
1	Scarcity	Physical availability of renewable fresh water, unsustainable use, demand for water from various sectors
2	Ownership Structure and Property Right	Well defined, security, stability, enforceability, flexibility and measurability of right.
3	Regulation	Optimal initial allocations, simple transaction mechanism, free information flow, decentralized management, beneficial use and good infrastructure.

Scarcity, Ownership Structure and Property Rights

Scarcity is an important element in the development of water market in South Africa. This scarcity that is largely a result of recurrent droughts has fuelled the imposition of water use restrictions in many parts of the country and it can be regarded as a condition that necessitates formation of water markets. Water is a public good in South Africa and entitlement to its use is obtained from the Department of Water Affairs and Forestry (DWAF). All water users are to be licensed and each license entails the condition of water use though these conditions are subject to revision at a 5 years interval due to the dynamic nature of water resource condition (DWAF, 1998). Since water rights are not permanent, but just for a period of 5 years though subject to renewal for a maximum period of 40 years, the present value of future returns will decrease. Nieuwoudt (2000) noted that the uncertainty introduced by the promulgation of the new National Water Act has caused previously active water trading in the lower Orange River to cease.

As noted earlier, the mandatory licensing process by water users in South Africa will result in water being allocated with the aim of achieving fair and equitable water use and also to protect aquatic ecosystem (DWAF, 2005). This is likely to create uncertainty in the future for areas yet to undergo the process. Also, property rights are constitutionally protected in South Africa which implies that it may not be revoked except it is done in public interest which usually attracts compensation

Due to the South Africa's concerns on environmental issues, equity and sustainability, there is likely to be a trade-off between flexibility and protection of third party right in the South African water market. The cost of maintaining flexibility may be high and prohibitive.

Regulation

Optimal initial allocation, simple transaction mechanism and free information flow

Contrary to the expectation of equitable water allocation, South Africa is characterized by high water allocation inequality. The Water Allocation Reform document (2005) states that the role of water allocation in redistributing water for equity purposes will increase with water scarcity which will in turn increase the level of uncertainty among traders whose water use could be decided less

by market forces than by authorities. Simplicity of transaction in South Africa water market is unlikely to take place as there are no specific regulatory guidelines which implies that any current application will be judged individually based on *ad hoc* regulations, thereby, increasing uncertainty in regulation and incurring high transaction cost. Also, according to the National Water Act (1998), auction process could be employed for in water stressed areas to distribute any newly available water after the compulsory licensing processes. Also for the marginalized water users in South Africa to benefit from water market, there is need for free flow of information with regards to water right sales, prices, availability and potential benefit of trade to water users at all levels (Holden and Thobani, 1996).

Decentralized management, beneficial use and good infrastructure

As noted earlier, in order to maximize efficiency in water resource allocation, there must be a combination of market forces and government regulations. The department of water and forestry (DWAF) play minimal role in processes and act purely as an overseer. The National Water Act specifies three level of management, namely the national level, the catchment level and local level. Ultimately the DWAF primary function is to formulate national policy and the framework within which the lower level management will work. Although at present the catchment agencies are not in place and the DWAF is responsible for tasks undertaken at each of the levels. In terms of facilitating the trade of water use entitlement, the minister of the DWAF reserves the right to regulate the circumstances under which transaction may take place; the conditions relating to transactions; and the procedure to deal with transactions (Mullins et al., 2004). Water is allocated in the most efficient manner (best possible use). In order to determine the best possible use requires considering environmental, social and economic objectives and also to ensure equity, sustainability of the environment and ecosystem. The National Water use Act (1998) states that for water entitlement to be granted, water use must be classified as an "existing lawful water use". This is aimed at guiding against hoarding water right for speculative or other purposes. However, as Pott *et al* (2005) noted, there is lack of infrastructure to facilitate trade from downstream to upstream water users. This will definitely reduce potential gains from trade.

5.0 POLICY INTERVENTION STRATEGY

As noted in this paper, a well and carefully regulated water system that is complemented by well-defined water rights that encompass a robust administration is the most efficient way to allow water resources to seek their best and highest use. In order to implement such a system in South Africa, however, the water rights and administration systems must be properly in place. Currently, the water situation in South Africa is characterized by high water allocation inequality and addressing this dilemma requires collective market and government regulation efforts. From a government perspective, the starting point must be engaging in traumatic changes in the way water rights are viewed in the country. The concept of private ownership of the right to water has not very much existed historically. The laws therefore need to be amended and modified to create a better understanding of private ownership in the public domain.

The same law modifications must also seek to establish an initial allocation process that takes into account historical water use in the country while at the same time re-dividing the use of water in an equitable manner that reflects the needs of the nation. Such water reallocation needs to compensate those affected by the reallocation process. Once the initial allocation has been put into place in a fair manner, and water rights are clearly recorded and quantified for each owner, then a market for water rights can be smoothly stablished in South Africa. As noted throughout this paper, efforts to decrease transaction cost and uncertainty are central to the successful implementation and functioning of water market. Three broad areas require critical attention.

Firstly, although the National Water Act was promulgated in 1998, little progress has been made in implementing the institution and regulations proposed, there is therefore need for institution and regulations to facilitate the market. Non-existence of the required institution and regulations will result in a significant increase in transaction cost of transfers that do not take place, which as noted, decreases the incentive to engage in trade. There should be establishment of decentralized bodies in order to achieve lower transaction cost.

Secondly, there is inadequate knowledge with regards to new approach to water management as set out in the NWA (1998), the ability to trade, and processes involved in transaction. Knowledge dissemination plays an important role in the success of a market because water users base their

decisions on the available information. Public registry recording all transaction information will make costly information readily available.

Thirdly, the regulations placed on transaction cost as a result of the aim of ensuring equity, and environmental protection are likely to restrict trading processes although it is done in the public interest, it may lead to uncertainty about the present value of future returns and security of tenure. This strong focus on environmental protection and socio-economic equity suggests that strict regulations on markets may be instituted by authorities in order to minimize third party effects. These increasing restrictions decrease the flexibility of transfers, as noted by Pott *et al* (2004), and therefore decrease the value right and gains from trade.

6.0 SUMMARY AND CONCLUSIONS

This study has presented an evaluation of the management and situation of water affairs in South Africa within the framework of a structured model of water market. High transaction costs have also been identified as a key factor inhibiting the proper function of water markets in the country. In this regard, the study suggests that for South Africa to achieve low transaction cost and a functioning market system, there is need to implements plans set forth in the National Water Act.

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