"Some, for all, forever"

Managing Water for Sustainable Development in South Africa

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Abstract

The World Summit on Sustainable Development in Johannesburg in 2002 addressed the impending threat of water scarcity as one of its five central issues. Demand for fresh water has risen over the last 30 years and continues to rise due to expanded economic development and population growth. However unsustainable withdrawals of water that do not take into account the importance of maintaining natural ecosystems will deplete renewable freshwater resources. For Sub-Saharan African countries the threat of water scarcity is exacerbated by arid climates and widespread poverty. South Africa attempted to pro-actively deal with these problems by adopting a policy of integrated water resources management (IWRM) in the National Water Act of 1998. This policy attempts to address both the environmental needs and basic needs of the poor in one policy towards water allocation. The main points that can be learned from the South African example are that IWRM should allocate water for environmental needs, basic needs of the poor as well as enforce water use charges on commercial users of water as economic incentives for conservation. Water management should be at the catchment level and encourage broad public participation. Finally, investment should be made in the development of more efficient irrigation as well as intensified agriculture. Information sharing and networking among countries of the region should be encouraged and lead by South Africa with the funding of donor organizations.

Introduction

The World Summit on Sustainable Development in Johannesburg in 2002 addressed water and the impending threat of water scarcity as one of its five central issues. "The challenge before all delegates at the Johannesburg Summit is to find ways to maximize the social and economic benefits from available water resources, while ensuring that basic human needs are met and the environment is protected." [1] With an understanding that water is a limited resource, nations must face the challenge that each use of water will affect other potential uses of water. In order to reach the goals set forth by the WSSD, it has become clear that water must be managed in an integrated framework that takes into account all the different uses of water including the reservation of water for the environmental health of water resource systems.

Water is an essential resource for drinking, sanitation, household use, food production, energy generation, industry, as well as natural ecosystems. Less than three percent of the worlds water is freshwater and much of this is not readily accessible. [2] Pressures from a growing population, pollution, and other unsustainable uses of water are putting this invaluable resource under threat. Since 1970, global water demand has risen at estimated 2.4 percent per annum. [3] The projected increase in water scarcity will have a disproportionately greater affect on many poor developing countries because of dry natural conditions and faster population growth. Developed countries like the United States and the European Union countries have enjoyed far more access to water as well as

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[1] UNEP Press Release, "Toepfer Calls on World Leaders to Address Global Water Crisis," p. 2.
[2] I. Serageldin, *Toward Sustainable Development of Water Resources*, p. 1.
[3] A. Kamara, "Water for Food, Livelihoods and Nature: Simulations for Policy Dialogue in South Africa" p.1

higher levels of water consumption. "Water consumption has almost doubled in the last 50 years. A child born in the developed world consumes 30 to 50 times the water resources of one in the developing world."[4]

Climatically, the arid and semi-arid regions Africa face explicit challenges in development with limited water supplies. Aside from climatic challenges, these nations face rapid population growth; as a result, they need to expand agriculture in a sustainable matter for future food security. However, achieving food security in a sustainable manner is inextricably linked to the sustainable maintenance of freshwater resources. More than 70 percent of the African population is made up of small-scale agriculturalists, thus making freshwater one of its most valuable commodities. [5] This population is very dependent upon renewable natural resources.

However, most of the regions policies and practices fail to reflect the high priority that needs to be placed on protection of surface and groundwater. Not only is water important to the survival of the plants and animals in aquatic ecosystems, but also ecosystems regulate the quantity and quality of water. Wetlands retain water during high rainfall and release it during drier periods, thus purifying it of many contaminants. Forests can reduce erosion and sedimentation of rivers as well as recharge groundwater. [6] These concerns for the environment are often not adequately prioritized in water policy in many developing countries. Presently water decisions are made without adequate information or process with an influential minority receiving a disproportionate share of the benefits.[7]

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[4] UN Press Release (March 5, 2003)
[5] World Bank, "Directions in Development: Building a Sustainable Future" p. 3.
[6] Mark Rosegrant et al. *World Water and Food to 2025* p. 7.
[7] Ibid, p. 24.

South Africa, however, after democratization, adopted a new water policy. The National Water Act, number 36, of 1998 promotes a policy of integrated water resources management (IWRM). This approach integrates concern and protection of the environment, a pro-active attempt to deal with social inequities, as well as an understanding of the economic value of water.

This paper examines how IWRM is an essential way to manage water scarcity. The National Water Act of South Africa is examined and evaluated in terms if its implementation since 1998. Recommendations are made for South Africa and then for other countries about the adoption and implementation of IWRM.

"Some, for all, forever" Integrated Water Resources Management in South Africa.

South Africa, a developing nation of approximately 44 million people in Sub-Saharan Africa, faces impending water scarcity. Water demand has been estimated to increase by 51.7 percent in the next 30 years. [8] The country's available water resources are already fully-utilized and under stress. The State of the Environment Report outlined three major driving forces of stress on South Africa's water: natural conditions, population and water policy. [9]

Natural Conditions and Hydrology

The average rainfall is 497 mm, just over half the world average of 860 mm. [10] Only 8.6 percent of the rainfall is finally available as surface water. [11] This is due to higher evaporation rates that exceed rainfall in most regions. The South African climate

[8] National State of the Environment Report *Freshwater Systems and Resources*, "Pressures #1," p. 4.
[9] National State of the Environment Report *Freshwater Systems and Resources,* p. 1
[10] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 379
[11] National State of the Environment Report *Freshwater Systems and Resources,* p. 2.

varies by region. The eastern and southern coasts are moderately well-watered, while the interior and western regions range from arid to semi-arid. Sixty-five percent of the country receives less than 500 mm of rain annually, which is considered the minimum requirement for dry-land farming, while 21 percent receives less than 200mm; furthermore 62 percent of the country's runoff originates on the eastern escarpment which only makes up 20 percent of the South African land mass. [12] Even in the areas that receive more rain, rainfall is highly variable because of frequent droughts. Also extensive evaporation of runoff in the western and interior regions contributes to aridity. Most of the country's rivers have been dammed to provide water, and as a result 50 percent of the nation's wetlands have been depleted and converted to other land use purposes. [13] The largest potential for untapped resources exists along the coasts, but are not the most viable options because they pose engineering difficulties. [14]

Groundwater occurs in over more than 80 percent of the country, but the quantity stored in these resources is low and the exploitation possibilities are limited. Groundwater is used mainly to provide water for small scale irrigation and domestic use on farms. [15] Groundwater overdraft also leads to harmful environmental effects including the reduction of surface flow. [16]

The demand for water does not always coincide with the spatial distribution of water. The location of metropolitan and industrial development has been driven by the

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[12] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 379
[13] National State of the Environment Report *Freshwater Systems and Resources,* p. 1
[14] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 382.
[15] Ibid, 383
[16] Of critical importance is the relationship between groundwater and surface water. Groundwater can only be abstracted on a sustainable basis at a rate less than, or equal to, its long-term average recharge through infiltration of rainwater. (National State of the Environment Report, p.2)

mining industry, the cornerstone of the South African economy. [17] However much of these locations are not near major river courses, and as a result in many catchments the need for water exceeds the supply. Water supply has been transferred to these areas by technological means of dams, inter-basin transfers and storage facilities. [18] Nevertheless, these technological processes are very costly and disruptive to ecosystems. "Dams are the major perturbation to continued river ecosystem functioning in South Africa." [19] On the other hand inter-basin transfers have been crucial to economic development in South Africa. In all regions outside the Northern Province, at least half of the gross domestic product is reliant on inter-basin transfer of water. [20]

Pollution

Water scarcity is further exacerbated by pollution of both surface and groundwater. Typical pollutants are industrial effluents, domestic and commercial sewage, acid mine drainage, agricultural drainage and litter. [21] The data on pollutants in South Africa is fragmented, however, acid mine drainage is a recognized problem in the mining areas of the country. [22]

Population and a Legacy of Inequality

The scarce situation of water supply is then met with the pressures of a large poor population. Population growth rates in South Africa had been fast relative to developed countries until a recent slowdown due largely to an increased mortality rate because of the AIDs epidemic. Between 1980 and 1998 the population growth rate was about 2.3

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[17] Economist Intelligence Unit: Country Profile: South Africa, p. 25.
[18] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 382.
[19] National State of the Environment Report *Freshwater Systems and Resources,* "State for freshwater systems and resources no. 3"
[20] Ibid.
[21]National State of the Environment Report *Freshwater Systems and Resources,*p.2
[22] Ibid, p. 2

percent.[23] The projected average annual rate for 1998-2001 is 1 percent, which is just slightly higher than that of the United States, but quite a bit lower than the projected average rate for this period for the Sub-Saharan region, 2.2 percent. [24] However, in spite of slower growth rate, almost 50 percent of the South African population is 'income poor,' meaning that each adult spends less then the equivalent of 60 dollars a month. [25] Thirty percent of the population is without access to piped water. [26] There is a strong link between poverty and water deprivation. The official unemployment rates in 2002 were at 29.4 percent.[27] The majority, around 70 percent, live in rural areas. [28]

The black African population is the overwhelming majority in seven of the nine provinces.[29] This part of the population is the poorest in a country with highly unequal income distribution as a result of decades of oppressive Apartheid rule.[30] Under Apartheid rule, land ownership was restricted to whites, and with this legacy, the country still has a highly unequal income and land distribution, with 13 percent of the population owning 87 percent of the land.[31] Most commercial farm owners are white, while many farm workers are black. Access to water is inextricably linked to income distribution and poverty in South Africa, as former land ownership and water use legislation was structured so as to benefit the minority white population with political access. Only 5

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[23] World Bank, *Building a Sustainable Future* the Africa Region Environment Strategy, p.21.
[24] Ibid, p. 21.
[25] Barbara Schreiner, *Catchment Management Agencies for Poverty Eradication in South Africa*, p. 395.
[26] Water for Food, Livelihoods and Nature: Simulations for Policy Dialogue in South Africa
[27] Economist Intelligence Unite: Country Profile: South Africa, p. 31.
[28] Barbara Schreiner, *Catchment Management Agencies for Poverty Eradication in South Africa*, p. 395.
[29] Economist Intelligence Unit: Country Profile: South Africa, p. 31.
[30] After independence from England, the descendents of Dutch settlers formed the Afrikaner National Party. To cement their control they established the Apartheid Rule in 1948, which institutionalized racial discrimination. In 1951, the Bantu Authorities Act set up a basis for ethnic government in African reserves called homelands. Between 1976 and 1981 nine million blacks were moved to these homelands losing their nationality as South Africans. Transition to democratization began in 1989.
[31] Barbara Schreiner, *Catchment Management Agencies for Poverty Eradication in South Africa*, p. 395.

percent of water for irrigation is available to smallholder farmers. [32] Those who lack access to water are not simply denied drinking water and water for sanitation but water for food production.

Water policy in South Africa prior to 1998 had more in common with European water law despite major differences in resources and climate. Access and use of water was governed by special interests who were white and wealthy. As a result, water allocation was based on the political clout of the white minority rather than reflective of the total cost environmental trade-offs. Commercial farmers as an important constituency of the Apartheid government were appeased with highly subsidized water irrigation schemes and dam development. Besides being unsustainable, water policy in South Africa prior to 1998 was highly inequitable.

Under Apartheid government, the previous water laws were based on a system of riparian rights, which link the right to use water and with the ownership of land adjacent to that water. There was a distinct separation between private and public water. Water users who did not have access to water as a result of land ownership could apply for access through soliciting the Water Court or by purchasing new land. [33] The system was complex with a lot of bureaucratic backlogs associated with all the permits and allocations. Pollution control was not well coordinated or enforced. [34]

Access to irrigation, which is still the largest use of freshwater and the most important means of production, was skewed by Apartheid legislation. Under the Apartheid government the development of government irrigation schemes was designed

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[32] Ibid, p. 395.
[33] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 392.
[34] National State of the Environment Report, *Freshwater Systems and Resources*, "Responses," p. 4.

to address the poor white problem and to resettle returned ex-servicemen.[35] Black farmers could not get title deeds to land and were thus excluded from benefiting from most government subsidies for irrigation. Having the title deed was also a pre-requisite for the formation and membership on irrigation boards and was essential to receive collateral bank loans. Small scale black farmers had very limited access to finances for the development of irrigation. The majority of old smallholder irrigation schemes on former homelands were non-functional or operating well below capacity. [36]

Another result of these former laws was the perpetuation of highly unequal access to even basic water service. In 1994 a study conducted by the Department of Water Affairs and Forestry showed that 18 million people lacked access to basic potable water services, defined as 25 liters per capita per day within 200 meters walking distance. [37]

New Legislation: The National Water Act of 1998 and the Water Services Act of 1997

After the end of Apartheid and the advent of democracy, it became evident that South African water policy had to change. It was no longer politically acceptable to maintain such drastic inequalities, and environmental issues were coming to the forefront. The transformation of the water law was a central aspect of the political events arising out of the end of the Apartheid era in 1994. The African National Congress, the leading opposition group to Apartheid under Nelson Mandella, is still currently leading the country. Under the new constitution, South Africa has had the unique opportunity to make progressive reforms to address the inequities created under Apartheid.

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[35] South Africa was colonized by the English and the Dutch in the 17th century.
[36] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 378.
[37] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 378.

In order to address these inequalities and attempt to proactively deal with worsening water scarcity, the South African government under the new democratic Constitution which came into force in 1997, introduced the Water Service Act number 108 of 1997 (WSA) and National Water Act number 36 of 1998, (NWA). The WSA is ensures that people's basic water needs will be met. The NWA uses sustainability and equity as "guiding principles." [38] "The National Water Act (1998) of the Republic of South Africa (RSA 1998) is not only widely recognized as the most comprehensive water law in the world, but also stipulates, clearer than elsewhere, that water is essentially a tool to transform society towards social and environmental justice and poverty eradication."[39] Through this new legislation South Africa attempts to deal with the threat of future water scarcity by taking the approach that water demand should be managed in an integrated framework where all water uses are considered together and access to basic water services by the poor are prioritized.

The NWA abolished riparian rights and made the central government, the custodian of the nation's water resources (NWA, Chapter 4). The entire water cycle is considered to be a common resource. The slogan of the water act sums up its approach, "Some, For all, Forever."[40] The policy is three-tiered: demand management of a finite resource, equitable allocation practices, and protection of ecological integrity. Ecological integrity is defined as the ability of a natural resource, like a river, to support and maintain a balanced, integrated composition of physico-chemical habitat and

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[38] National Water Act, Act no. 35, 1998/ Chapter 1
[39] Barbara Schreiner, *Catchment Management Agencies for Poverty Eradication in South Africa*, p.394.
[40] J. Harris, *Water Resource Quality Policy: The Approach Adopted by the Department of Water Affairs and Forestry under the Water Law Principles*, p. 32.

characteristics, and biotic components, on a temporal and spatial scale, that are comparable to the natural characteristics of ecosystems of the region.[41]

The NWA prioritizes the allocation of water. Water is allocated in an integrated framework at the catchment level. The first allocation is The Reserve, which consists of two parts, the first is the basic human needs reserve and the second is the ecological needs reserve. The basic human needs reserve provides for the essential needs of individuals served by the water resource in question. These human needs include water for drinking, sanitation, and cooking. It has been set at 25 liters per day per person.[42] In 2000, the government also provided a subsidy for the first 6000 liters per household per month. The ecological reserve is the water required to protect the aquatic ecosystem of the water resource. The amount of each reserve is determined after the water resource is classified by the Department of Water Affairs and Forestry (DWAF). [43]

The next allocation of water goes to basic productive uses. These are defined as 'Schedule 1.' Schedule 1 sets aside certain water uses that are permissible under general authorization, which includes water for reasonable domestic use, smallholder livestock, and for small scale gardening for non-commercial purposes. Outside of Schedule 1 uses, the water use must be licensed. This compulsory licensing can be initiated by the DWAF where and when needed. It cancels all existing licenses and replaces them with a new allocation schedule. Redressing inequities from the past and addressing over-allocation are key criteria for the reallocation under compulsory licensing. [44]

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[41] J. Harris, *Water Resource Quality Policy: The Approach Adopted by the Department of Water Affairs and Forestry under the Water Law Principles*, p. 33.
[42] Barbara Schreiner, *Catchment Management Agencies for Poverty Eradication in South Africa*, p.397.

[44] Barbara Schreiner, *Catchment Management Agencies for Poverty Eradication in South Africa*, p.397.

Water use charges have also been legislated in the NWA. The NWA seeks to manage demand by establishing a pricing mechanism, which charges commercial users of water in order to recover costs of water services as well as give economic incentives to conserve water. Part 1 of the NWA gives the Minister of the DWAF the authority to establish a pricing strategy, which may differentiate among geographical areas, categories of water users or individual water users. Section 56 states that the pricing strategy can use water use charges for funding water resource management, for funding water resource development, and for achieving equitable and efficient allocation of water. Non-payment of water use charges will attract penalties including possible restriction or suspension of water supply. The functioning of this system will depend on the transparent and reliable enforcement of fees.

Water use charges also have environmental objectives. If the price of water is appropriately high for commercial users, these users will have economic incentives to conserve water and seek higher value uses of water, for example, switching to a less water intensive crop or intensifying areas under irrigation rather than expanding irrigation. Higher water prices should also encourage the development of more efficient irrigation technology. Also water use charges are used in a 'polluter pays' framework. To encourage a reduction in waste-emission a system of economic incentives has been suggested in which charges would be introduced for the discharge of waste into water bodies. This will encourage the development and use of low waste and non-waste technologies. [45] This is supported by the idea that there is a cost associated with ecological management of a catchment and this should be paid for by all users of the

[45] J. Harris, *Water Resource Quality Policy: The Approach Adopted by the Department of Water Affairs and Forestry under the Water Law Principles*, p. 34.

resource. However to preserve water equality, the polluter is supposed to pay the cost to the whole resource. This 'polluter pays' framework works only if emissions charges are high enough and enforced.

Water use charges are meant to encourage conservation of water resources. In water-stressed catchments it may be necessary to introduce additional economic incentives to optimize allocation of scarce water resources between competing uses. With price as an incentive it should shift low value uses of water to high value uses of water.

Pricing in the irrigation section is supposed to reach full recovery of operation and management costs. There is a surcharge above costs to counter under-recovery during droughts. [46] Pricing in the irrigation sector should also cover future replacement and drainage work costs. In the former homeland schemes prices would not be levied initially. Part of the financial goal of a pricing system is to manage costs more efficiently in the water utility and encourage private investment. [47]

Water use charges have social objectives as well. The cost of water for basic needs is born by economic or commercial users of a water management area, system or government water storage area. [48] Economic users would be users that use water for non-Schedule 1 uses. In redressing imbalances to previously disadvantaged farmers and addressing their direct claim for access to irrigation water from government schemes, the state is committed to providing support through land restitution, land reform or other programs of corrective action.

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[46] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 403.
[47] Michael Schur, *Pricing of Irrigation Water in South Africa*, p. 402.
[48] Michael Schur *Pricing of Irrigation Water in South Africa*, p. 400.

All of these aspects of the NWA are to be implemented through a "cooperative governance" mechanism through the DWAF and Local Governments. This vertical and horizontal governance is a drastic change from the formerly top-down approach of centralized water management. Ultimately the NWA will be fully implemented through Catchment Management Agencies (CMA). The NWA established 19 water management areas in South Africa that are governed by CMAs. The CMAs will carry out the functions of water resources planning, registration, water charge collection and water authorization. Public participation in the establishment process as well as in the governing boards of the CMAs is legally required. While the CMAs are still being formed the DWAF will handle these duties.

Evaluation: South Africa as a Case Study

The NWA on paper seems to embody the goals of sustainable development as set out by the WSSD. However the process of implementation of the legislation on paper in to actual practices has been a continuing challenge. The NWA sets out to prioritize water for ecological purposes as well as for basic human needs and then to use economic incentives to increase the efficiency of water use and technology as well as cover costs. The NWA and other IWRM policy should be evaluated on how well it can promote all of its goals: environment, equity and efficiency.

Environmental Goals

While it is clear that not much can be done about the natural conditions of freshwater resources in South Africa, reserving water for environmental health is imperative for the future of the water supply. As described previously, water is vital to natural ecosystems as well as the regulation of quantity and quality of the water

resources. If water is withdrawn in an unsustainable manner, the natural ecosystems will be disrupted and will fail to renew themselves at a substantial level. In order to implement the NWA, a water resource is first classified in terms of its ecological integrity. This includes a combination of measurements that include measurements of biodiversity in the aquatic ecosystem, monitoring habitats, measuring physical and chemical characteristics of water, measuring geomorphological characteristics, as well as measurement of water flows.[49] After classification, water resources can be rehabilitated and managed properly. These measurements go into determining the amount of water necessary for the environmental reserve allocation.

While this system of classification is necessary, it is costly and requires constant monitoring and updating. At the same time it reinforces the need for water management to be at the catchment level because of the variation and specificity of each resource. The investments in research and training to conduct water resource classification will be high, but still vital. The DWAF monitors fluctuations in water supply through a network of gauging stations.

The Department of Environmental Affairs and Tourism's White Paper on the Integrated Pollution and Waste Management puts forth the policy initiative that water quality and quantity should be considered and managed together. Under this framework the natural aquatic environment is an integral part of the water resource, not just another user, and no water or land user can be impose on that resources so that the natural environment's survival is compromised. [50] Enforcement of these regulations requires a regulatory framework that involves monitoring, and permit allocation. The DWAF still

[49] J. Harris, *Water Resource Quality Policy: The Approach Adopted by the Department of Water Affairs and Forestry under the Water Law Principles*, p. 34.
[50] National State of the Environment Report "Responses," p. 2.

has the authority and responsibility to regulate water quality. Under the NWA, the person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources. These measures can be determined by the local CMAs. CMAs can also take measures against those who do not comply to pollution regulations.

Water use charges, which are most effective when adjustable, might meet implementation hurdles because of bureaucratic backlog. They have been implemented since 1999 in the form of the Water Discharge Charge System (WDCS). It charges users who dispose of their waste in water. In general, these policies have been most successful when the coordination of environmental protection in water policy integrates both water quantity and water quality.

Equity Goals

The second yet equally important goal of the NWA is to allocate for basic human needs, in order to address inequities left by the legacy of Apartheid. As for providing the 'basic human needs' allocation of the Reserve, implementation is a matter of infrastructure and institution building. The DWAF is responsible for these services after both the NWA and the WSA of 1997. Under Apartheid the homeland governments managed rural water supply in their own areas. The DWAF had experience mostly with providing bulk water to water and irrigation boards in the areas populated by whites. This lack of experience in addition to the difficulties and variations involved in working with former homeland systems will make the process more difficult.

Fostering community-based integrated water management is extremely important to working towards the achieving of equity and the alleviating of poverty. "An integrated

approach to water development and management with strong people's participation is most essential in rural communities, where the same water source is used simultaneously for drinking, domestic, and a diverse range of productive purposes."[51] The CMA is the body that is supposed to implement this decentralized community approach to integrated water management.

The implementation of CMAs has been approached in several ways. The most common hurdle is communication between top-down technical side of the DWAF the bottom-up community groups. It is important that CMAs are implemented through public participation as this will ensure their sustainability in these communities. This communication between officials from DWAF must be fostered with local governments and communities. The DWAF has been most successful when utilizing local NGOs to utilize their networks with community leaders and people.[52] CMAs need to be established so that they are governed by water users. This process involves extensive information provision regarding the new rights and responsibilities of water users. It needs to be available local languages, and communicate with local governments. Staffing of DWAF officials should be localized. Currently DWAF is working to form relationships with the communities, CMAs will become a crystallization of these relationships. These interactions have been a forum between high-volume users and the poor. For example, a bottom-up community activist resolved disputes over groundwater overdraft from the mining sector which was negatively impacting water supply in a local area by causing boreholes. [53]

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[51] Barbara Schreiner, *Catchment Management Agencies for Poverty Eradication in South Africa*, p.398
[52] Ibid,p. 400.
[53] Ibid, p. 400.

Part of addressing equity in water policy, involves addressing water as a means for production for the poor. Currently Schedule 1 only includes water use for gardening for non-commercial purposes. However it is increasingly realized that gardening by poor farmers is often market-oriented, at least for part of the harvest. If Schedule 1 included low volume users of water that was limited to users with a certain income cutoff, perhaps just above the poverty line, it could be used to promote smallholder production as well as alleviate the practical impossibility of tracing millions of low-volume water users for registration and licensing. [54]

Efficiency Goals

The basis behind the NWA is that the big commercial users of water pay at the level they value water use. The revenue generated by this pricing strategy should cover the cost of operations and management of water services, at least the cost of integrated water management, and could perhaps aid in financing the expansion of water services to the poor.

Demand management is necessary as increase water supply would involve importing water from other countries or developing new, expensive and currently infeasible technologies like the desalinization of sea water. Economic incentives for conservation and low waste technologies could prove to be effective, if pricing can be calculated at levels high enough to force farmers and other water users to make economic decisions that will benefit the objectives of the policy.

The irrigation sector is the largest user of freshwater resources. After the allocations for the environment and basic human needs, large commercial farmers will have to compete for resources. Water pricing mechanisms if priced correctly can be

[54] Ibid p. 397.

effective ways to encourage efficiency in water use. Studies in pricing have shown that the most effective economic incentive for efficiency in water demand is to price irrigation water at marginal cost. [55] Often common practice is to charge fixed flat rate for irrigation, but this does not reflect variation by volume, time of year or location, all factors which reflect the value of water. Pricing on a per hectare basis allows for unused allocations and does not provide enough incentive to rationalize. If water is under-priced then farmers will make higher than optimal margins. In the end the most efficient pricing mechanism is marginal cost pricing which maximizes the joint water users to joint water supply. Implementation costs need to somehow be covered in the pricing strategy.

However, policies involving the limitation and pricing of irrigation should be accompanied by coherent agricultural policies. Approximately 1.27 million hectares in South Africa are currently under irrigation schemes. [56] Sustainable irrigation development has been projected to be limited to 1.58 million hectares. [57] However in the same projection of the national food balance, shows that irrigation would have to expand to 1.778 million hectares in order to have continued food security in 25 years. This amount of expansion however is infeasible in terms of the water supply. Other intensification possibilities and yield enhancing options in both irrigated and rain-fed production need to be examined. Agriculture can be intensified in several ways: achieving higher crop yield, improving water management to increase the value of effective rainfall, and increasing the investment in rain-fed areas. [58]

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[55] Michael Schur, "Pricing of Irrigation Water in South Africa." Power point presentation at AMAECO Conference 2002, "Irrigation Policies: Micro and Macro Economic Considerations."
[56] A. Kamara, "Water for Food, Livelihoods and Nature: Simulations for Policy Dialogue in South Africa" p. 9.
[57] Ibid, p.9.
[58] Mark Rosegrant. *World Water and Food to 2025*, p.11.

In addition much water is loss to inefficiencies in irrigation. Flood and sprinkler systems make up 88 percent of irrigation systems in South Africa. Flood irrigation systems in South Africa are estimated to have a 55-65 percent efficiency while sprinklers have about 75-80 percent efficiency. Even a small improvement would have a large impact. [59] Improvement in irrigation should therefore not about expansion about intensification, research into more efficient technologies that will waste less water. Drip irrigation is an alternative to more common sprinkler or spray irrigation used in most of South African irrigation schemes. Drip irrigation channels the water through pipes, it loses very little water to evaporation and directs water closer to plants thus decreasing waste. Agricultural subsidies should be reevaluated from a water perspective to ensure that water is at high value uses. Water intensive crops should not be subsidized in areas that are water stressed.

Monitoring Mechanisms of the NWA

Several provisions of the NWA lay out a legal framework for the monitoring of the policies set forth by the NWA. Chapter 13, section 125 allows authorized personnel to enter onto private property for routine, unannounced inspections of water use. Chapter 14 establishes the grounds for the creation of a national monitoring system that would assess the quantity and quality of available water resources, as well as the health of aquatic ecosystems. This would also entail a national information system that would store and provide data and information for protection and sustainable use of water resources as well as planning environment impact assessments, and dealing with public safety and disaster management. Water disputes and offenses are heard before a Water Tribunal (Section 146). The CMAs manage water on the catchment level and carry out

[59] Ibid p. 9.

environmental monitoring for that catchment. However, water is supposed to be governed at the local level with the influence of water user associations. Unlike CMAs these institutions are associations of individual users rather than agents of water management.

The NWA has been recently implemented, therefore conclusions about its success or failure are difficult. However it is necessary that the progress towards the goals set forth by the NWA: environmental protection, increased equity and increased efficiency, is tracked. Sustainable water resources management needs to involve an integrated framework. South Africa legislation provides this framework. Decisions from DWAF through the local CMAs need to reflect an understanding that water use allocations must strike a balance between present needs and protection of the resource for the future.

Recommendations

Focus on South Africa

South Africa's NWA is a relatively new policy that seems to take into account many of the important problems with water allocation. However implementing this policy will be a challenge. Donor organizations and Non-Governmental Organizations therefore can aid South Africa in the implementation of IWRM in the following ways:

1. *Giving aid for up-to-date technology to take assessments of water resources. Environmental assessment for determination of environmental reserve should integrate quantity and quality assessments.*

It is clear that a certain amount of water must be preserved to sustain water resources and aquatic ecosystems. Determining how much water is to be reserved involves both an evaluation of water quality, as well as quantity. The classification of water resources should be updated as frequently as is feasibly possible. An accurate

estimate of the environmental conditions of water resources in South Africa will be vital to fending off water scarcity. The coordination between the DWAF which is taking these assessments and local CMAs which carry out the policy will be imperative. Measurements of environmental conditions should take into account the connection of the whole hydrological cycle including the interaction between groundwater and surface water. Donor organizations could perhaps form partnerships with DWAF to aid in the implementation of viable and accurate environmental assessments.

2. *Facilitating the implementation of Catchment Management Agencies (CMAs) through broad public participation.*

CMAs are designed to be an adaptable mechanism to local conditions. Therefore CMAs will be most effective when they are established in such a way that they reach communities especially the rural poor. The DWAF can form connections with these communities by utilizing NGO community-based networks. The NGO community can help bridge overcome the political barriers between government officials with technical backgrounds and rural communities in the former homelands that ruled themselves without access to government services in the past. Partnerships between local NGOs and DWAF have been and could continue to be imperative in the establishment and running of CMAs. A community-based approach to CMA formation will foster the goals of equity and make the CMA a forum for negotiation over competition between high-volume water users and the poor.

3. *Giving funds for the proper training of officials to administer IWRM as well as programs that provide information to water users about their new rights and responsibilities of water use under the new NWA.*

There is currently a deficit of people with the technical education to serve as officials in IWRM. An initiative to encourage training in this area and especially the training of black Africans, would ensure future representation in water policy at all levels of the whole community.

Training also needs to be provided on the local level in the form of information provision about the rights and responsibilities of the new water law. Information needs to be provided to local communities that explains recent changes in water law in local languages. This information should also include information on how individuals can get involved at the in water users associations at the community level. A training and information provision initiative could be funded and implemented through a partnership between the DWAF and international organizations like United States Agency for International Development (USAID). USAID has funding set aside for "Building Human Capacity" which involves these types of training activities.

4. *Supporting the expansion of water access for production at the small holder level in order to further the goals of achieving equity.*

Water is an important means of production to rural farmers. Expanding Schedule 1 for the poor and small scale market-oriented gardening could improve livelihoods if promoted in a sustainable manner. While the first priority should remain on expanding basic water access to all, it is important to support the basic means of a livelihood for rural inhabitants. By allowing water for small scale production for the poor, water access could have extended benefits. This policy would also be efficient as it would save the registration costs of all many smallholders. Schedule 1 access could be expanded on an income basis.

5. *Providing technical information about the implementation of full cost water pricing at marginal cost.*

Full cost water pricing for larger scale consumers of water will force commercial water users to pay for water in a way that reflects its social value and scarcity. It will encourage the efficient use of water as pricing it at marginal cost will price it at irrigators willingness to pay. It should help manage demand and force farmers to choose shift from low-value water use to high-value use. However this system of pricing is only successful if the price of water is high enough to change decision making about water use. It should aim to recover at least the operations and management costs of IWRM. Agricultural policies and subsidies should reflect the same understanding of the economic value of water so as not to distort economic incentives of water pricing. It is important that agricultural policies are water-sensitive. Water intensive crops should not be subsidized in water scarce areas. Many international organizations fund research on rural development and agriculture, it is important that these organizations consider the importance of the relationship between water scarcity and food security. The International Monetary Fund is supportive of full-cost water pricing, and could aid in the formation of such a pricing strategy.

6. *Investing in the improvement of irrigation as well as the intensification of rain-fed agriculture.*

Ensuring future food security through agriculture is vital for the future of South Africa. However the expansion of irrigation that will be sustainable is limited. Investments should be made into the intensification of irrigation in this region as well as improving efficiency of the irrigation methods in place. USAID's Food Security Initiative

could be a possible partner in the funding of research and development of more sustainable irrigation technologies. Currently drip irrigation is considered an efficient technology that has spread in different parts of Asia. Perhaps a partnership could be established for the technology transfer of drip irrigation.

Implementing Integrated Water Resources Management in other African Countries

Many other African countries face impending water scarcity for similar reasons as South Africa: climate, a growing population and an overall growing demand for precious resources pushed by development. The most important lesson learned from South Africa is that governments are key actors in managing water scarcity. An IWRM approach like the NWA of South Africa is strongly advised. Water needs to be considered a scarce resource and allocated accordingly. Organizations like the World Bank and USAID can help South Africa and other African countries by funding the development of IWRM as well as serving as forums for information-sharing about IWRM.

While each country must adapt to its local conditions, the key policy goals in IWRM should focus on the following:

1. *The allocation of water for environmental needs.*

Water must be allocated for the protection of the water resources. Unsustainable use of water by humans have worsened scarcity problems. Without proper environmental management of water resources, these resources will not be renewable for future generations.

2. *An integrated water resource management approach should also allocate for the basic human needs of water for the poor.*

Water-deprivation is linked to poverty. The government and aid to the government should be dedicated to expanding water infrastructure to the poor. Access to clean water is an important step to alleviating poverty.

3. *A full-cost pricing strategy should be instituted for commercial uses of water.*

Freshwater must be recognized as a scarce commodity. The scarcity of water should be reflected in economic incentives in the form of prices. This will encourage more efficiency in farming and conservation of water while also generating revenue to fund IWRM.

4. *Management should be at the catchment level.*

Management of water resources is most effective at the catchment level. This allows for a flexible mechanism that can adjust to the needs of various situations. The better tailored the environmental assessments are to a particular resource, the more effective management can be.

5. *Institutional mechanisms of IWRM should encourage broad participation.*

All uses of water are inter-linked, therefore it is vital that all stakeholders are provided with the institutional mechanisms to participate in catchment management. This is especially important for the poor who often lack political voices and influence.

6. *Investment in better irrigation technology that is more water-efficient, as well as the intensification of rain-fed agriculture is necessary.*

For the future of food security in Africa, water policy cannot be seen in a vacuum. It must be implemented with complimentary agricultural policies. Foreign aid should be investing in developing the sustainability of irrigated agriculture by making it more water-efficient.

7. *International cooperation is necessary. A network for information sharing about IWRM could be formed and lead by South Africa to share experience and provide training.*

Because most river basins cross international borders it is important that African nations work together to achieve the same goals of sustainability of water resources. African nations, especially those in the Sub-Saharan African region can share knowledge about IWRM through a network over the internet. Information sharing of technical knowledge will be vital for the success of the region. A network of this type could be accessed most practically via Internet. USAID sponsors the development of internet access in Africa through its Leland Initiative. The World Bank, which has coordinated much research and funding for IWRM development, could be a possible partner for the development of such a network.

Measuring Success in Integrated Water Resources Management

IWRM policy is initiated and implemented for the purpose of addressing the preservation of the environment, the needs of the poor and the overall efficiency of the system. Progress towards these goals should be assessed on a regular basis. The environmental goal of protecting water resources can be measured by looking at indicators for wetlands. The leveling off of wetland loss would be a good indicator of success. Other indicators that would be important would be pollution levels of lakes and rivers. The equity goal could be measured by the number of people with access to water. An increase in these numbers would indicate success in the expansion of basic human needs resources. Finally the efficiency goal would be indicated by whether or not the revenue generated through the pricing mechanism could cover open costs. Another

indicator for the efficiency goal would be whether or not commercial users of water began to conserve water or switch to higher value uses of water.

Conclusion

"Sustainable water resources management in Southern Africa can only be achieved by striving for a reasonable balance between the short-term needs of people for social and economic development and the longer-term imperatives for protection of natural resource base. If that balance is struck, water resources can continue to provide benefits to improve people's livelihoods and quality of life." [60]

This balance is critical for sustainable development. Water, because it is so vital to so many aspects of life and livelihood, is an incredibly valuable commodity. Water policy, however, does not exist in a vacuum. The politics of water allocation often ends up acting as a hindrance to achieving that "reasonable balance" that is necessary. It is crucial for governments to operate in a transparent way and prioritize allocation in a manner that is cognizant of the value of water and responsibility of maintaining it as a resource.

[60] Rafik Hirji "An Environmentally Sustainable Approach to Water in Southern Africa," p. 23.

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