



Kenya's water Resources: Scarcity or Sheer Mismanagement?

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Abstract

Kenya has always been described, mostly from within, as a water scarce country and in some instances as 'chronically' water scarce. Unfortunately, this is arrived at by merely looking at the population against the availability of freshwater, giving the issue a demographic dimension alone. Other useful and perhaps indispensable parameters such as efficiency of allocation and use, level of technology and funding in the sector are simply ignored in the scarcity equation. This portrays population growth and physical endowment as the only factors responsible for the scarcity condition and such a perception may compromise sound policy making. The present article looks at the water resources of the country within the concept of water scarcity and audits the widely held belief of a physical water scarcity in the country. The article takes the position that the country suffers more from a 'management scarcity' which translates to a social resource scarcity implying a policy failure than a physical scarcity. An enabling environment, most importantly, a strong political will, is, of necessity, required to ensure water security. This appears not to be a matter of possibility but a matter of willingness and Singapore's case, which is briefly discussed in this article, serves to elucidate.

Keywords: Political will, Social resource scarcity, Water resources, Water scarcity, Sheer, Mismanagement.

Introduction

The significant link of water to life probably gives an exceptional meaning of water to human world¹, but at the same time it is taken for granted in many instances. Water users, the law and decision makers seem to be absolutely given wrong idea by the simplicity of the water issue, as "everybody uses it daily and it looks quite simple" (Ivan Cheret)². Water has not only remained in the physical realm but has also been dragged to the spiritual realm. An excerpt from the Kuan Tzu book reads, "People all like to go up higher, but water runs to the lowest possible place. This principle of going down to the bottom is the Palace of the Tao, and the instrument of true rulers; the bottom is where water goes and lives"³.

It has been observed that in case the world encounters problems of water, it will be attributed to the sheer management of this precious commodity (water) and not because of the physical scarcities⁴. However, one wonders why something that forms our daily life and is abundantly around us, in which we even swim and through which we travel suddenly becomes scarce.

In addition, it has been indicated that the world's population is growing by about 80 million people a year, thus increased freshwater demand of about 64 billion cubic meters annually. Further, it was estimated that 90% of the 3 billion people who

are expected to be added to the population by 2050 will be in developing countries and many of them will be in areas whose present population lacks stable access to clean or safe drinking water which is coupled with lack of sufficient sanitation. Additionally, these areas suffer the problem of financial resources which is worsened by lack of good governance and institutional capacity in provision of these needs. More importantly, the regions that have experienced the availability and fair access to water supply for the last two decades may probably experience the loss of these benefits because of the rapid increase of their population⁵.

It is projected that in Africa, approximately, 75-250 million people might be faced with increased water scarcity because of the impacts of climate change by the year 2020. The increase of population will definitely raise the demand of water supply which in turn will negatively impact the livelihoods of the affected people and worsen water-related issues⁵. It is noted that water is less available on the African continent than in Europe, Asia, North America or Latin America and that population increases will reduce per capita water availability⁶.

It is observed that Kenya will face a severe economic water scarcity beyond 2025. Its water resources potential is sufficient to meet 'reasonable' water needs by 2025, but will have to embark on massive water development projects, at enormous

cost and possibly severe environmental damage, to avert the scarcity⁷.

Whereas it is true that since independence in 1963 Kenya's population has grown, this alone may not suffice to explain the decreasing per capita water quantity. The purpose of this article is to audit the belief that Kenya is a chronically water scarce country since this belief, being founded on demographic scarcity indicator only, is likely to jeopardize opportunities for sound policy making and approaches to ensure water security.

Water Resources of Kenya: An Overview

The area size of the Republic of Kenya is about 582 646 km² in which 11,230 km² (1.9%) is occupied by water. In 2009, the country's population was recorded to be 38.9 million. According to the National Environment Management Authority, 2003, more than sixty percent of the economically active population depends on agriculture, which generates considerable pressure on the natural resources leading to land and water degradation. Access to safe water is estimated at 68% in urban areas and only 49% in rural areas though these statistics seem to differ from publication to publication⁸.

On average, the country's rainfall is approximately 630 mm annually. Generally, it ranges between 200 mm in the northern part of the country (Arid and semi-arid areas) to 2000 mm in the western region. In relation to air temperature, it varies from 40°C in the low altitude arid areas to below freezing point on Mt. Kenya. The availability of rainfall in the country is influenced by a number of topographic features such as Mt. Kenya, the Aberdare ranges, the Rift Valley, the Mau Complex and Mt. Elgon. These mountain ranges from the main catchment areas and together with the Rift Valley influence the drainage patterns in the country⁸. It is indicated that the average available water in Kenya is estimated at 20.2 Billion Cubic Meters (BCM) annually which is distributed within the five drainage areas of the country⁹.

It is further projected that by the year 2020, the country's per capita availability of water will be 359 cubic meters due to the increase of the population and might even fall further if water resources continue to be depleted⁹ (Figure-1).

Water demand in different sectors within the country such as industry, wild life, infrastructure, hydropower as well as the agricultural related activities including farming, irrigation, and livestock, plus the domestic consumption will definitely bring about water stress in the country. More importantly, from the National Water Master Plan, a significant increase of water demand has been recorded as from 2073 Million Cubic Metres (MCM)/year in the year 1990 to 5817 MCM/year in the year 2010. It was estimated that water resources storage would need to be increased 30-fold of 1992 levels to meet the demand. However, the average national water abstraction remains at about 5.4% of the potential resources volume which reflects a

very low level of water development.

The National Policy on Water Resources Management and Development through the Water Act 2002 guides the water resources management and the provision of water services in the country¹⁰. The Act gives the legal and Institutional framework for the management and development of Kenya's water resources and the provision of water services. It identifies the Ministry of Water and Irrigation (MWI) as the trustee of all water resources in the Country and spells out the major function of the Ministry of Water and Irrigation as that of policy formulation and sector coordination. The Act has provided for the creation of the Water Resources Management Authority as the institution responsible for the conservation and development of water resources with other roles that include; Protection of quality of water resources, monitoring and enforcement of permit conditions, determination of applications for water use permit, management and conservation of water catchments, determination of charges for use of water resources, provision of information on water resources and Liaison with sector bodies and institutions. Water services provision is overseen by the Water services Regulatory Board at the National level with institutions at the regional and local levels. Figure-2 shows the institutions and their relationships under the Water Act⁹.

Physical water scarcity in Kenya: A perception or a reality?

Water is said to be scarce when there is a shortfall between what is available and what is required for plant growth and for societal uses¹¹. The complexity of water scarcity concept is more as compared to simple ratios, especially physical ratios, can indicate¹. It has been acknowledged that it is hard to examine the true scarcity of water in the physical sense (a supply problem) or its availability in which it should be utilized and managed well (a demand problem)¹². This therefore makes the definition of water scarcity difficult, lacking a common admissible definition. In this case, for an area to be defined as "water scarce" the following aspects must be considered: - i. the definition of the needs of people— this puts into account how the environmental needs and the water for nature are defined; ii. what fraction of the resource is made available, or could be made available, to satisfy these needs; iii. the temporal and spatial scales used to define scarcity.

With regard to water scarcity in the country, ".....The average annual available water is estimated at 20.2 BCM. This available water if divided equally to an estimated population of 31.2 million people in 2002, the endowment of water is 647 cubic meters per person per year. By global categorization Kenya is therefore classified as water scarce country...Kenya is chronically water scarce with a limited natural endowment of fresh water. the per capita availability is projected to fall to 359 cubic meters by 2020 as the population is increasing and could be even less if the resource continues to be depleted....."⁸.

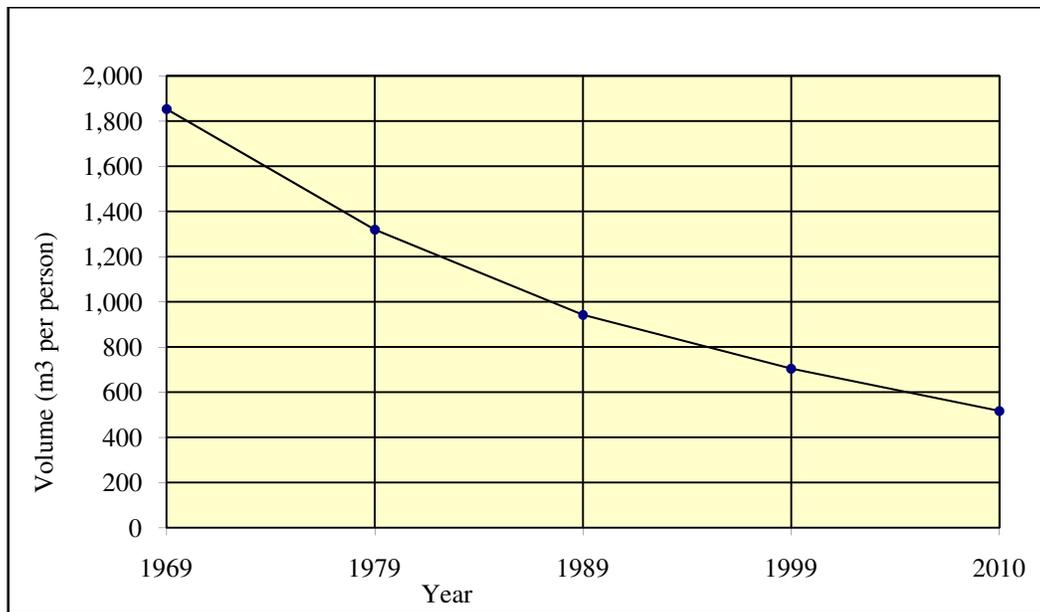


Figure-1
 Availability of Water per Capita⁹

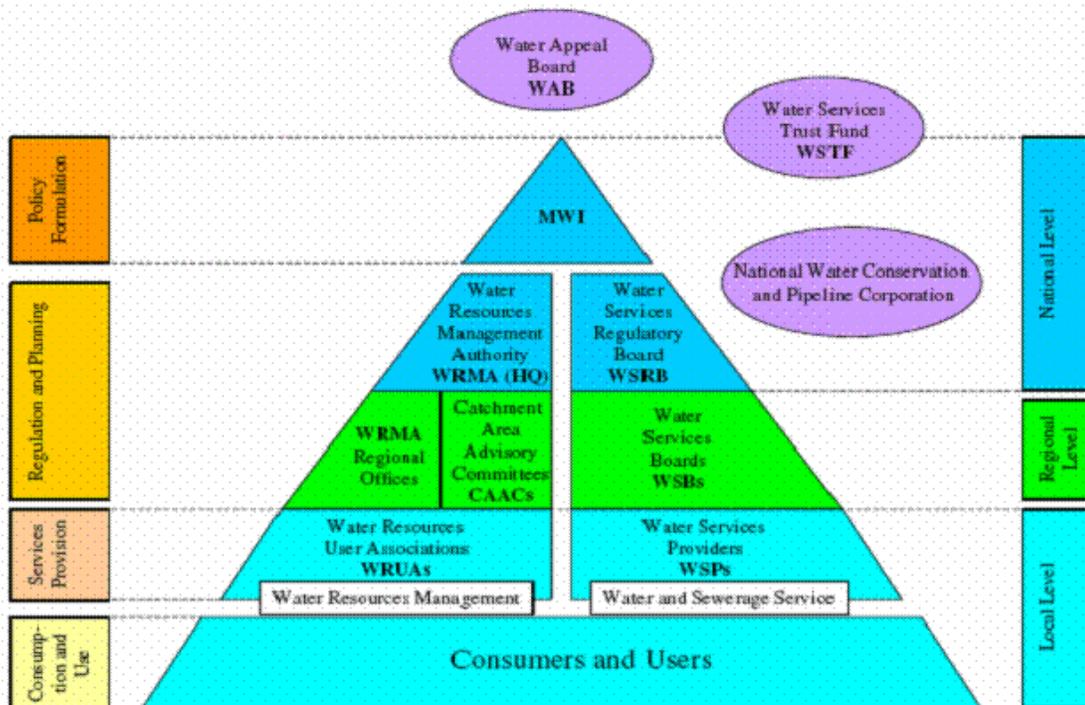


Figure-2
 Institutional Set-Up under Water Act 2002⁹

Most of the country's documents on water resources and other related documents often use this argument when referring to water scarcity in Kenya. This indicator is the Falkenmark water stress indicator. According to this indicator, per capita per year is 1700 m³ of renewable water resources which is based on estimates of water requirements in the household, agricultural, industrial and energy sectors, and the needs of the environment.

For those regions which cannot maintain the 1700 m³ usually encounter water stress. On the other hand, if this figure goes below 1000 m³ the area suffers chronic or simply water scarcity, and for the regions with figures below 500 m³, are said to endure complete water scarcity. But this indicator does not elucidate the true picture of water scarcity.

In Kenya, for example, the equation used to determine water scarcity has just one denominator, population. This portrays population growth as the only enemy with regard to water scarcity. However, this is quite deceptive since population growth is not only the aspect that influences water use. Such a scenario is dangerous and may lead to a skewed policy formulation. Other useful tools such as improvement of efficiency of use and allocation are easily overlooked.

Another index is the Water Resources Vulnerability Index which presents scarcity as the total annual withdrawals (water use or demand) as a percent of available water resources². Therefore, any water from the rivers, streams or groundwater aquifers for human needs satisfaction is referred to as water withdrawals. The authors further suggested that if the annual withdrawals range between 20 and 40% of annual supply, then that given area is termed as a water scarce region. Additionally, if the figure exceeds 40% then the region is seriously and severely water scarce. Kenya's annual water withdrawal stands at 5.4% though its water demand in 2010 was expected to be 5817 MCM versus an annual availability of 20 BCM.

Three orders of scarcity in which water shortage can be determined include physical, economic and social adaptations respectively. Perceiving scarcity mainly in physical terms limits opportunities for policymaking and approaches for capacity building. It is important to understand the concept of water scarcity because it is paramount to the stakeholders and is also likely to influence effective policies which address the water crisis¹.

“What you see depends on the story you wish to illustrate”¹³. Suffice to say, Falkenmark Index clearly illustrates water scarcity and risks of conflict that underscores the seriousness of water problems in any region. These arguments therefore raise concern that calls for collective action to be undertaken in order to provide a direction for societal action. In this regard therefore, Kenya is justified to believe in her perceived water scarcity condition only if this belief can spur meaningful efforts towards water security; but to the disappointment of the authors this may not be the case.

It is argued that shortage of access to natural water; whether a region is endowed or lacks water resources, will be classified under the first order of water scarcity¹⁴. In addition, a society that is unable to manage its way around first order scarcity is subject to a second order scarcity. Accordingly, the second order scarcity refers to technological and institutional adaptations that make management of a natural resource more efficient. In addition, the third order of scarcity shifts focus from the technical and microeconomic aspects towards social realm that depends substantially on social, political and cultural changes. Further water resource should not be limited to consumption only to those who have it¹.

In essence, this implies that water security can be reached

against a backdrop of either sufficient physical endowment or the lack of it. If the country so believes that it suffers a water scarcity stemming from its meager endowments and does not do enough to manage this condition it risks suffering another order of scarcity.

As the focus shifts from water resource scarcity to lack of adaptive capacity in countries and societies, it is argued that there is a need to adjust the projections of water scarcity to better reflect these realities¹⁵

Generally two thirds of Kenya is classified as Arid and Semi-Arid Lands (ASALs) on a scale that is not clear. Due to lack of generally accepted definitions and approaches, there is an unfortunate lack of uniformity, such that, for example, the term “semi-arid” can be used in quite different qualitative meanings. The concept basically tells us no more than that rain is irregular, droughts are recurrent, the evaporative demand high, and that water is periodically rare¹¹.

Since Kenya is one of the arid regions, it therefore suffers from ‘green water’ scarcity, which makes crop production dependent on the addition of ‘blue water’ through irrigation². Green water is a very important resource for global food production. About 60% of the world staple food production relies on rain-fed irrigation, hence, ‘green water’¹⁶. Categorizing a two third of Kenya as arid and semi-arid lands paints a picture of a water scarcity country. While these areas could be suffering green water scarcity they may not necessarily be suffering from blue water scarcity. However, the former is often used to explain the latter hence the perception. This confusion has led to a blanket belief that the country is “chronically water scarce”. By way of example, most of the land which surrounds Lake Turkana, a relatively fresh water lake, suffers from green water scarcity but not blue water.

The International Water Management Institute noted that Kenya has sufficient renewable resources. In order to make these resources available, the country must make significant investment in water infrastructure so as to make the resource available to people. Failure to achieve this will make the country be classified as “economically water scarce” implying that despite being abundantly water available in nature, it has not been developed for human use⁷.

The country altogether forgets that it has got a share of the Indian Ocean as a water resource. Paradoxically, this resource is not included in the country's water budget regardless of its suitability. The utilization of this resource can be traced in the early mechanized water supply system during the construction of Kenya-Uganda railway. The arrival of the colonial power from the UK found severe scarcity of portable water on Mombasa Island and constructed a condensing plant for purification of sea water¹⁷. In the line of assessment of water scarcity, it is believe that water quality must be counted as one of the major variable.

In this case, the question remains whether polluted water should be measured as part of the resource available for satisfactions of human needs after it is treated or ignore it all together¹².

Sheer Mismanagement of Kenya's Water Resources

Water resources management depicts societal resolve required to address scarcity. Enhancing efficiency in overcoming water scarcity is vital. However, such measures will lead or attract increased costs on the society¹⁵. Globally, there is no common accepted administrative model sufficient enough to address water resource development, including supply and waste treatment at both public and private sectors. This failure is no exception in Kenya. For example, it is argued that the new water policies must put into consideration the concept of public participation since no policies should be implemented without public involvement².

This therefore, calls for the engagement of the people affected by such policies as well as interest groups. Suffice to say that the involvement of the public in governmental projects enables citizens to be part and parcel of the decision making process. Decisions emanating from such a process have greater legitimacy and higher chance of sustainability. The Water sector reforms in Kenya were propelled by this argument and offer an excellent opportunity for better management but a lot more needs to be done. So far we have witnessed a weak establishment of the institutions envisaged in the reforms leading to the ground situation remaining largely unchanged.

In a context where the pressure on limited amounts of water is on the increase, the ability to cope hinges on social resources and human ingenuity. It is necessary to develop strong institutions, both formal and informal, that will have the capacity to develop, allocate and promote the best possible utilization of water. Contrary to the previous generation of institutions, which were supposed to execute a supply strategy, the qualities of the institutions that have to handle water demand strategies must be a combination of formal and informal, where the users of water and the various other stakeholders are adequately represented¹¹.

The different management levels of responding to water scarcity can be viewed as three turns of a water screw. At each stage of adaptation to water scarcity, the need for input of social resources is higher than the previous. At the first turn of the water screw, scarcity is recognized as a pure natural resource scarcity and the response is obviously "how to get more water". Kenya has, hitherto, responded in this manner implying zero social resources employment. At the second turn of the water screw it becomes clear that additional water may not be possible. At this stage end-use efficiency is emphasized- "more use per drop". The third turn involves allocation decisions. As water becomes rare in any society, it becomes necessary to address its availability while determining priority areas, in order

to achieve optimal results. For instant, it is pointed out that 70% of the nation's water resources in Israel is devoted to agriculture, yet only 3-5% of the GDP is generated from farming (Hillel Shuval)². One wonders on the logics of investing in high efficiency in water resource development if so very little is gained. It was observed that if allocation efficiency is not achieved, it is possible, and even common, to be doing the wrong thing extremely efficiently. It would therefore be much more useful to be doing the right thing, with efficiently allocated water resources¹¹.

In this context therefore, the policy options for Kenya would be whether the country must necessarily produce its food via irrigated agriculture? Or maximize its food output under rain fed agriculture through all means possible? Or achieve food production sufficiency without necessarily having to produce the food ourselves thus relying on virtual water? Or is our lifestyle and diet such demanding in terms of water requirements for food production and other uses? This has its own demerits especially in a country like Kenya where a large portion of people depends on agriculture, largely subsistence, not only for food production but for their entire livelihood. Therefore this calls for massive creation of new jobs in the cities and industries. Caution has been raised on whether the option of re-allocations from lower- to higher-value uses through the market ignores social realities which may lead to secondary conflicts with a high social cost¹⁵.

Water scarcity should not necessarily be used as an excuse for inadequate water service delivery. For example, water required for domestic use is said to be small amount as compared to the water required for other basic needs. According to Falkenmark index, inaccessibility to water does not necessarily imply water scarcity, instead it is attributed to the poor water service delivery and also lack of sufficient financial resources¹². Incidentally and more importantly, it is worth to note that there are many countries in the world experiencing arid conditions yet they effectively manage any water resources. For instance, Botswana and Israel are good examples that have surmounted this challenge¹.

In the water scarcity debate, the mostly conveyed media imagines are of people suffering acute thirst¹⁶. Incidentally, thirst is not necessarily a problem of water scarcity but rather of water management. Worldwide, there is almost enough water everywhere to meet basic needs if properly managed. Apparently, lack of adequate water for households' uses is more of a function of lifestyle, management and financing than of availability. The poor water service delivery in Kenya has nothing to do with water scarcity but has everything to do with poor management. Indeed, management of water resources bears on water service delivery.

Political misdirection has perhaps been at the Centre of water resources mismanagement in any given country. Political commitment is the basis of all forms of development especially

in the contemporary world. Where there is a will there is always a way. Physical endowment is not necessarily the limiting factor when it comes to development but political will does. A country like the Democratic Republic of Congo enjoys a huge and rich endowment of natural resources including water but successive lack of political will has subjected its people to untold poverty. Interestingly, governance of natural resources presumes a state's wealth as a function of the availability of such resources¹.

Water Scarcity is not a terminal illness; on the contrary it is a manageable illness with all possibilities of full recovery. Scarcity of any commodity presents, by definition, a business opportunity³. Despite Kenya being categorized among water scarce countries, apparent actions seem to perpetuate this condition. For instance, encroachment on and destruction of the main water catchment towers does not make the situation better. Ironically, efforts by line authorities to restore these areas have been openly resisted by higher political elites. Attempts to reclaim the Mau Complex, a major catchment for the Lake Victoria basin often face resistance attributable to lack of political goodwill.

The country needs to take strategic measures that are required to combat and arrest water scarcity. Among urgent strategies is to combat poverty. It is understood that the soaring poverty levels are exacerbating depletion of catchment areas, since poverty and environment are closely and intricately linked. However, poverty can be successfully rebuffed through proper environmental management¹⁸.

Singapore's Case

Indeed, political will can successfully address water scarcity and ensure water security. In reference to the case of Singapore, successful water development relies on robust political will. Water scarcity wholly relies on the water security⁴.

Singapore as a small city-state with area of 700 km² and a population of 4.8 million can be said to be densely populated. The country has limited natural water resources and can therefore serve as an example to the countries with water problems. Singapore has an annual rainfall of 2,400 mm but, it has a small land area to sufficiently capture and store this rather high rainfall amounts. This is exacerbated by the lack of natural aquifers or groundwater. Hence the country was classified by the United Nations as being water-scarce. On attaining independence in 1965, Singapore continued to rely on imported water supply from Johor (Malaysia) in addition to supplies from the local sources. After realizing the sources available were inadequate for the country's projected growth and development, the leadership adopted recycling and desalination as additional sources.

Given the aforesaid, Singapore has expanded its water supply sources and achieved a sustainable system. Therefore, the country has realized its long-term security of water supply

today. In a nutshell, Singapore can be described as been self-sufficient in water supply; a good lesson to other developing countries including Kenya.

Conclusion

In conclusion, an observation of water situation in Kenya leaves a person with big question of whether the country is a victim of water scarcity or of sheer mismanagement of the resource. Kenya continues to face unprecedented increase in water demand and a reducing water supply per capita. Interestingly though, in a wet year the country forgets that it is a 'water scarce' state only to be reminded in a drier year. This is manifested by the apparent lack of water capture during wet periods. If rain water can be harvested and if we can prevent damage by floods, we can manage and maintain a sustainable water supply and determine the water regime in the country. This is the case with Egypt whose average annual precipitation is much lower than Kenya but ends up selling virtual water to Kenya.

Kenya's water resources management approach should address the first turning of the screw, which is the first step towards improving water availability to the citizens. This realization would be a clear demonstration that the country appreciates its water scarce situation.

Despite the seemingly water scarce situation in Kenya, this paper holds the belief that the country is not chronically water scarce. Though vast part of the country is semi arid or arid and therefore water scarce, the situation is more a function of mismanagement, poor governance of resources, low political will and lack of public involvement rather than physical lack of endowment.

References

1. Wolfe S. and Brooks D.B. (2003). Water scarcity: An alternative view and its implications for Policy and capacity building. *Natural Resources Forum*, 27, 99-107.
2. Falkenmark M. and Lundqvist J. (1998). Towards water security: political determination and human adaptation crucial. *Natural Resources Forum*, 21(1), 37-51.
3. Stikker A. (1998). Water today and tomorrow; Prospects for overcoming scarcity. *Futures*, 30(1), 43-62.
4. Luan I.O.B. (2010). Singapore Water Management Policies and Practices. *International Journal of Water Resources Development*, 26(1), 65-80.
5. World Water Assessment Programme (WWAP) (2009). The United Nations World Water Development Report Water in a Changing World. 9-47 (Paris: UNESCO, and London: Earthscan.
6. Showers B.K. (2002). Water Scarcity and Urban Africa: An Overview of Urban-Rural Water linkages.

- Development*, 30(4), 621-648.
7. Seckler D., Barker R. and Amarasinghe U. (1999). Water Scarcity in the Twenty-first Century. *International Journal of Water Resources Development*, 15(1), 29-42,
 8. World Water Assessment Programme (WWAP). (2006). The United Nations World Water Development Report 2. Water: A Shared Responsibility, 483-486. (Paris: UNESCO and New York: Berghahn Books).
 9. Republic of Kenya, Ministry of Water and Irrigation (2005). The National Water Resources Management Strategy (NWRMS). Department of Water Development, Nairobi, Kenya.
 10. Republic of Kenya (2002). The Water Act 2002, Kenya Gazette Supplement No. 107 (Acts No. 9). Government Printer, Nairobi, Kenya.
 11. FAO (2000). New dimensions in water security- water, society and ecosystem services in the 21st Century. Land and Water Development Division, FAO, Rome.
 12. Rijsberman R.F. (2006). Water scarcity: Fact or fiction. *Agricultural Water Management*, 80, 5-22.
 13. Ohlsson L. (2000). Water Conflicts and Social Resource Scarcity. *Phys. Chem. Earth (B)*, 25(3), 213-220.
 14. Leif Ohlsson L. and Turton A.R. (1999). The turning of a screw: social resource scarcity as a bottle-neck in adaptation to water scarcity. <https://www.soas.ac.uk/water/publications/papers/file38362.pdf>
 15. Appलगren B. and Klohn W. (1999). Management of Water Scarcity: A Focus on Social Capacities and Options. *Phys. Chem. Earth (B)*, 24(4), 361-373.
 16. Savenije H.H.G. (2000). Water Scarcity Indicators; the Deception of the Numbers. *Phys. Chem. Earth (B)*, 25(3), 199-204.
 17. Whitehouse R.N. (1902). To the Victoria Nyanza by the Uganda Railway. *The Scottish Geographical Magazine*.
 18. Nellemann C. and Corcoran E. (Eds) (2010). Dead Planet, Living Planet: Biodiversity and Ecosystem Restoration for Sustain-able Development. A Rapid Response Assessment. United Nations Environment Programme, 5-63 (GRID-Arendal: UNEP).