

Source water supply diversification - investing for the future

18 JUN 2019

BY: DR SHAFICK ADAMS

I bet that almost all policy and decision-makers have a direct or indirect investment portfolio. Most investment portfolios are diversified across a variety of stocks and bonds to minimise risk, to preserve capital and generate returns. Diversification is a well-established mechanism to protect a portfolio from volatility to the same events. In addition, a smart investment portfolio has a long-term game plan, it is continually interrogated and adjusted when required. [Modern portfolio theory \(MPT\)](#) suggests that "... an investment's risk and return characteristics should not be viewed alone but should be evaluated by how the investment affects the overall portfolio's risk and return".

In the water context, climate change, lower rainfall, population growth, economic expansion, storage depletion (like siltation of dams), over-allocation, pollution and so forth creates volatility in the water supply portfolio. You have probably worked out where I am going with this analogy.



©Kidsana Maimetook – [123RF.com](https://www.123RF.com)

The primary input to our water resources is rainwater and the rainfall is unevenly distributed in time and space. A recent WRC study confirmed that 10% of our water source areas provides 50% of the mean annual runoff. Combined with climatic patterns, topography, the spatial distribution of population and industries, South Africa is inherently a water scarce country. This is worsened by an increasing shift towards overall lower rainfall and higher evapotranspiration in southern Africa. Surface storage systems consist of about 4,395 registered dams, 3,601 of these are small dams serving mainly agriculture and municipalities. The few low capacity desalination plants (brackish groundwater and seawater) are localised. Groundwater is widely but unevenly distributed, owing to the complexity of our geology. Groundwater is predominantly used in agriculture, rural water supply and some urban supply - Tshwane uses between 8-13% groundwater from springs.

Mitigating against water scarcity

Source water supply planning and development must be diversified to mitigate against water scarcity — a serious threat to South Africa's water security. UN-Water defines water security as, "The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability". By borrowing concepts from the investment sciences, we can build a narrative, and tactical plan to diversify our source water supply portfolio for different scales and contexts. Our water supply options must consist of a mix of surface water reservoirs, groundwater aquifers, seawater, rainwater harvesting, stormwater harvesting, fog water harvesting, direct and indirect wastewater reuse and so forth.

There is even evidence to suggest that harvesting break-off icebergs and cloud-seeding can provide additional water under periods of severe water scarcity. Traditionally, South Africa had a source water portfolio that consisted mainly of surface water reservoirs and some groundwater.

This goes against having a diversified portfolio that can mitigate against water shortages. All of its investments and institutional configurations serviced mainly surface water systems — a bubble was created; another economic term we are all too familiar with. 98% of our available surface water has been allocated and if you add to that the complexities of climate and weather variability and water losses among others it is easy to predict the future challenges.

On a broad scale, it seems that South Africa is fairly well-covered concerning water supply options. However, large parts of the country are water insecure. Water insecurity can be grouped under availability, access and usage. If you interrogate water security plans it becomes clear that it deals mainly with bulk water supply options and not smaller decentralised systems. Water security can be experienced at the household to catchment level. As an example, groundwater provides >5 % of the water supply to 36% of all settlements in South Africa. A large proportion of the 36% relies 100% on groundwater. Although a small proportion of the overall water system, groundwater provides 100% water security for large parts of the country where surface water source networks are not available.

Serving the unconnected

However, if you look at the investments and institutional support for this resource, it becomes clear that water security is not the main driver when we plan. Large investments are made for bulk water systems with the assumption that it reaches most of the population. In the main, it provides water security for urban areas linked to these bulk systems. It is estimated, in the National Water and Sanitation Master Plan (NWSMP), that by 2025 that there will be small increases in groundwater supply and the incorporation of acid mine drainage water into the supply mix. Desalination will also increase marginally as a percentage of the total water supply. The bulk of the desalination will come from coastal seawater units. Several desalination plants are already operational in Kwa-Zulu Natal, Eastern and Western Cape. Similarly, the All Towns studies promote mostly two options. No sense is given about how the unconnected will be served, the mostly already under-served rural areas.

There needs to be a paradigm shift in our planning and how we assess water supply needs and the options available in *all* settings to ensure water security for *all*. Again, we can borrow a concept from MPT called the efficient frontier. The efficient frontier allows investors to understand how a portfolio's expected returns vary with the amount of risk taken - considering the various options (split between bonds and stocks). The investment combinations that make up the portfolio determines the overall returns. Here the risk can be construed as accessibility to the resource, energy requirements, infrastructure investments and availability, topography, assurance of supply, water quality and so forth. Based on these, a suitable combination of source water supply options can be developed into a water supply mix that can be managed conjunctively and is locality relevant. Any good savings plan has passive income or has defensive investments - in there we can create a portfolio with demand-side interventions such as behaviour change, water efficient devices, reducing water losses, efficient agro-practices, pricing strategies, managed aquifer recharge, improved storage and enforcement of bylaws and regulations.

Hydro-amnesia

Jurisdictions that diversified its source water supply coupled with demand-side interventions are generally more water secure than areas relying on a single supply source. When a single supply source is under threat decision-makers scramble to diversify its supply. What is strange though is that once the source that was yielding poor returns starts recovering there is a move away from the diversification strategy – and planners and decision-makers experience hydro-amnesia until the next supply shortage. I bet that they would not allow this to happen to their personal investment portfolios. The administrator or investment consultant will probably get the boot.

ABOUT THE AUTHOR

Dr Shafick Adams is an executive manager at the Water Research Commission.