African Boreholes Initiative

Providing water to our people

A paper on : Ground Water In Kenya

GROUND WATER IN KENYA

Ground water is one of the earth's most important resources and its development can play a big role in a country's economy. It becomes a usable resource when the water beari

ng formations are permeable enough to allow water to infiltrate through them, to yield adequate quantity of good quality water for use through boreholes, hand dug-well and springs, and can be replenished from recharge sources to permit continued exploitation.

Ground-water is susceptible to quality degradation that can result from poor environmental sanitation. In the rural areas, shallow well are particularly threatened by discriminate solid waste disposal as well as seepage of untreated sewage from septic tanks and pit latrines. The sanitation means most popular in both urban and rural areas are use of pit latrines. The risk of shallow wells contamination in urban areas is bound to increase in proportion with the increase of human population in the informal settlements where the sanitation coverage is lowest. In urban areas ground-water is equally under threat of contamination from raw sewage and industrial effluent discharges seeping into the ground and reaching water bearing rock formations.

Salient Points on Groundwater

- Groundwater is generally free from effective surface pollutants and has the advantage of being less susceptible to changes in chemical composition and temperature variation.
- The major source of water supplies for agricultural and industrial purposes has been groundwater systems, even though these developments are less obvious than utilization of surface water.
- Groundwater is relatively simple source to develop and less costly than surface water.
- Ground water is a renewable resource, maintains relatively constant temperature and greatly reduced evaporation loss.
- Currently ground water resources of Kenya are underdeveloped with only 0.18 billion cubic meters per annum extracted from a total estimated safe yield of 1.08 cubic meters.

Challenges of Groundwater

- Historically ground water is least understood and as it is invisible, is often underestimated and in some instances over-exploited and polluted.
- With the imminent threat of climate change and sea level rise, ground water resources along coastal zone will be more susceptible to quality degradation

associated with sea water intrusion. The susceptibility will also arise generally from low recharge rate against increasing extraction.

- Capacity building in ground water exploration and mapping is very critical in overall water resources management.
- Over 80% of Kenya's surface area is semi-arid and arid where majority of the population depend on ground water but with inadequate ground water personnel and equipment.
- Water scarcity in ASAL is often leads to water use conflicts at points of ground water extraction.

Although the major groundwater aquifers are relatively low yielding, there is still additional room for ground water recharge both to the deep aquifers and the shallow perched aquifers.

We recommend that the Water Recourses Management Authority (WRMA) prepare a country ground water map which depicts boreholes monitored and classification of the aquifers. Most of the extensive aquifers are confined within major geological units.

Aquifer classification

The WRMA should classify aquifer systems in a concerted attempt to identify Kenya's ground water resources and to rank their importance in each of the major catchments areas and nationally. This is an essential pre-requisite to any management strategy.

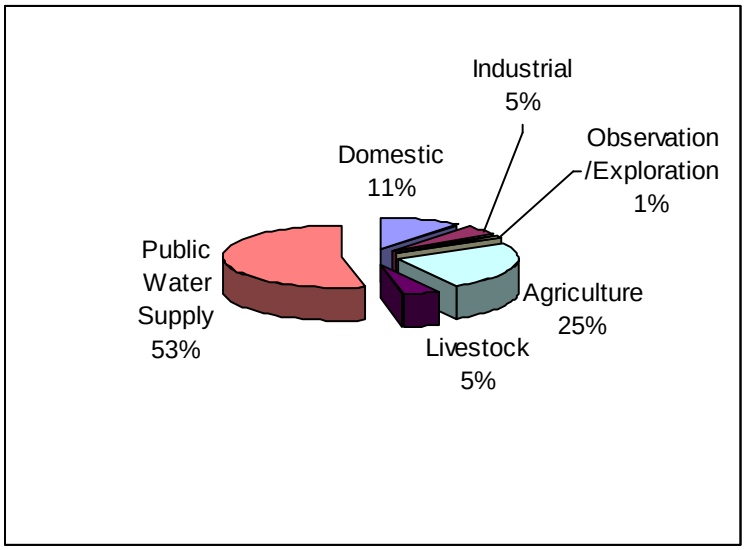
This classification system recognizes the value of aquifers in a quantities and qualities terms as well as social and economic values the society attaches to ground water resources. This recognition allows monitoring resources to be earmarked to those aquifers under stress (over-abstraction, and saline intrusion or pollution), in turn allowing development of strategies to reverse or slow-down deterioration.

The classification system is simple in concept and classifies aquifers on the basis of their importance and vulnerability. It is also flexible enough that different catchment areas may ascribe different values to their aquifers (thus for example Basement aquifers in one region could be considered "minor" aquifer while in another they could be classified "poor") Classifications can be described as in the table below.

Classification of Aquifers

Class	Description	Examples
Strategic aquifer	Aquifer used to supply significant amounts/proportions of water in a given area and for which there are no available alternative resources, or where such resources would take time and money to develop: significant trans-boundary aquifers	Sabaki, Tiwi, Nairobi, Central Merti, Nakuru, Kabatini, Lake Naivasha, Lamu Island
Major aquifer	High-yield aquifer system with good quality water	Daua and Elgon Volcanics
Minor aquifer	Moderate-yield aquifer systems with variable water quality	Mandera Jurassics
Poor aquifer	Low-to negligible-yield aquifer systems with moderate to poor water quality.	Basement
Special aquifer	Aquifer systems designated as such by WRMA	Isinya

BOREHOLES WATER SUPPLIES USED BY SECTOR



Codes Of Practice/Standards

Recognizing that many stakeholders will be involved in groundwater investigations and development, WRMA should develop draft codes of practice for key ground water development activities. The process could lead to development of the following draft codes of practice, guidelines and policy proposals:

- Siting of water supply boreholes
- Supervision of construction and inspection of construction of water supply boreholes
- Test pumping of boreholes
- Groundwater protection – Proposal for national policy
- Guidelines for artificial ground water recharge
- Guidelines for aquifer monitoring

Two additional codes of practice could cover :

- Construction of water supply boreholes
- Interpretation of test pumping data from water supply boreholes.

Proposed Way Forward

As a way forward the following issues should be given priority and consideration:

- Completion of draft National and catchment aquifer (hydro-geological) maps
- Groundwater and drought vulnerability – classifications and mapping
- Groundwater modeling as a tool for groundwater management for simple strategic aquifers with quality/time series data.
- Design and construction of dedicated monitoring boreholes network.
- Development of an analysis and reporting protocol for ground water monitoring data.
- Research functions as relates to artificial ground water recharge; pollution monitoring, data analysis and interpretation
- Design and construction of Artificial treatment wetlands
- Guidelines on shallow well siting and construction where on-site sanitation systems are in use.
- Design and construction of sub-surface and sand dams.
- Implementation of appropriate catchment conservation measures.
- Given interaction between surface and ground water, some surface areas should be identified and set aside for ground water recharge.
- Design and construction of sanitary landfills for solid waste management and disposal as opposed to dumping in the disused quarries.

- Implementation of adoption measures to mitigate adverse impacts of climate change on water resources.