Natural Springs of Sri Lanka: An Overview

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1. Status of Water Resources: Past and Present

Water is a unique gift of Mother Nature. Although water is the most widely occurring natural resource on the earth, covering nearly two-thirds of its surface, only less than one percent of fresh water is accessible and usable by man and animal. Therefore, water is a precious resource and a basic need for sustenance of all forms of life. From ancient times, water has been the focal point in our civilisation and early settlement schemes in the dry zone. Therefore, our ancestors treat water with reverence. Sri Lanka, compared with many other countries, is an island nation endowed with a high annual rainfall (avg. 1800 mm) and well distributed network of water bodies, making it rich in water resources, in terms of total aggregate available. For example, the per capita water availability was about 6000 cubic a meter per annum in the 1950 s' which has now declined to about 2100 cubic meters per annum (Yogarajah, 2002). However, population growth, rapidly increasing urbanization and industrialization over the past few decades have led to an increasing demand for water, creating a shortage of safe and clean water, especially during the dry season. Further, physical availability of water and its quality is being seriously threatened by over-exploitation of groundwater resources for intensive agriculture, climate change and man-made pollution.

Basically, water resources exist either as **surface water** or as **groundwater.** Rivers, lakes streams, ponds, large reservoirs and small village tanks belong to the surface water bodies, while groundwater resources are stored in shallow or deep aquifers, and therefore, groundwater is a hidden resource, not easily accessible to people. Many decades ago, rural people, particularly in the Dry Zone, depended on surface water sources to meet their drinking water supplies and other domestic needs. But, today, almost all surface water bodies have become polluted due to man-made activities. Therefore, over 80 percent of rural population depends on groundwater sources such as dug wells, tube wells and agro-wells for meeting their water needs (Niyandagoda, 2008). But, in recent, years due to over-exploitation of groundwater in the Dry zone, many shallow wells either dry up during the dry season or water gets contaminated with toxic chemicals from agricultural inputs.

In some dry zone areas (e.g. North Central Province (NCP)), more than 40% of deep tube wells are reported to be contaminated with excess Fluoride (Perera et al., 2008) and unsuitable for drinking and cooking purposes. As a result, rural people face many hardships due to lack of safe and clean fresh water, especially in the dry season.

In this scenario, fresh water from natural springs which has remained largely an untapped resource, offers a huge potential as an alternate water source for the rural community. Natural springs are so vital to the country's well-being as they are the main water sources that feed the streams which in turn nourishes our river-system. However, our knowledge of the natural springs is somewhat meager.

The purpose of this article is to provide an overview of the natural springs in Sri Lanka and to highlight its potential as a water source easily accessible to rural communities.

2. Classifications of Springs

Springs are classified as **natural, thermal** and **mineral,** according to the chemical composition of its waters (Arumugam and Ranatunga, 1974). In the past, thermal or hot springs have attracted lot of attention, especially as popular bathing spots. Many such springs occur in the Eastern coastal region of Sri Lanka. By contrast, natural springs have not received much attention until recently. At present, there is a growing appreciation of their contribution in sustaining dry weather water flow in streams and water courses.

Some of these natural springs are large in size which is referred to as **"Bubula"** in rural areas (Arumugam and Ranatunga, 1974). They are mainly distributed in areas underlying the quartzitic rock in the Dry Zone and maintain water flow throughout the year (Perennial). The small sized natural springs are referred to as **"Ulpotha"** and most of them maintain a steady flow of water during the wet season and reduce water flow to a trickle or dry up completely during the dry season.

3. Occurrence and Distribution of Springs

A spring is a natural flow of groundwater from soil or rock surface and occurs wherever groundwater table intersects with ground surface (Arumugam and Ranatunga, 1974). The flow of water from a spring is affected by fluctuations of the groundwater table between the dry and wet season. Such springs are usually associated with three main types of rocks, Quartzite, Crystalline Limestone and Fissured gneisses or Schists (Arumugam and Ranatunga, 1974) .

Back in 1970, **Water Resources Board** conducted an islandwide survey (Arumugam and Ranatunga, 1974) to collect basic information about the springs in the country, and they identified as many as 225 natural springs distributed throughout the country, either on Government land or Private land. The distribution of natural springs is shown in Table 1 and Figure 1. It is clear from the above Table that a large number of springs is concentrated in Badulla District (71 Nos.) followed by Anuradhapura (26 Nos.) and Matara (23 Nos.) Districts. We are fortunate that there are so many natural springs in this small country, yielding millions of gallons of fresh water to enrich our water resources. However, some of these springs may have been destroyed or damaged by human activities during the past few decades.

4. Quality and Quantity of Spring Water

As the water flows out or discharged from a spring is well filtered through its passage of soil strata or rock fissures, spring water is of very desirable quality free of any pollutants. Spring water is therefore much safer to use, in contrast to other water sources. However, water quality would be entirely dependent on the chemical nature of the rock or soil strata through which it traversed. For example, spring water moving through crystalline rock appears to be well filtered before it flows out of the spring. In contrast, spring water flowing through laterite rock surface would show the presence of iron and appears turbid (Arumugam and Ranatunga, 1974). The Water Resources Board has recently analyzed several water samples collected from natural springs on few locations. The chemical data given in Table 2 clearly show that spring water is of very high quality and not contaminated with organic pollutants.

The quality and duration of water flow from a spring are dependent entirely on the amount and distribution of rainfall that recharge the groundwater, soil drainage and water holding capacity of soil. It has been estimated that the perennial large springs (Bubula) which are located in the Dry Zone areas underlying the Quartzitic rock are high yielding, producing about 100,000 gallons of water per day during the wet season and about 50,000 gallons per day during the dry season (Arumugam and Ranatunga, 1974). By contrast, those springs underlying the Crystalline Limestone rock are capable of producing a moderate yield of 25,000 - 50,000 gallons per day. Such springs occur in Badulla and Matale Districts. Spring water from these possesses a clear appearance free of organic pollutants.

5. Use of Spring Water

Until recently, much less attention has been paid to derive the maximum benefit from these virtually untapped water resources. However, with the looming scarcity of safe and clean fresh water supplies, there is a compelling need to exploit natural springs as a potential water source for rural communities, especially in the Dry Zone.

One such highly productive fresh water spring is located on a temple land in Kebithigollewa DS Division in Anuradhapura District. This spring is popularly known as "Gonamariyawa" fresh water spring, yielding a copious flow of water throughout the year (Plate 1). Spring water from this site is being used for drinking and other purposes such as bathing, washing. Further, the overflow from the spring is being used for cultivation of paddy and vegetables by the local community. Similarly, there are few other popular springs in Embilipitiya (e.g. Sudugala in Panamure) and Polonnaruwa areas and other parts of the country, frequently visited by local people and public.

There are few springs utilized by local authorities for rural water supply schemes. More recently, few bottled drinking water companies have harnessed natural springs on private lands, for manufacturing bottled water which has a well-established ready market both locally and overseas.

Also, there are some perennial springs yielding copious flow of pure and clean water, which can be used for pipe-borne water supply schemes for the benefit of larger community in rural areas. In some areas of the NCP such as Padaviya, Kebithigollewa, Medawachchiya, Mahanuwaragampalatha, Mahavilachchiya, Medirigiriya and Welikanda, many people, particularly farmers in the 40 - 60 years age group suffer from Chronic Kidney Disease (CKD), which is suspected to be due to the consumption of water contaminated with excess Fluoride and heavy metals such as Cadmium and Lead (Liyanage, 2008). So far, no permanent cure has been found to restrict the spread of CKD in this area. As an interim measure, medical specialists have advocated that switching to spring water may check the incidence of CKD in the NCP (Wijewardena, 2008).

Above all, fresh water springs play a very important function of sustaining the continuous water flow in river basins and catchment areas.

6. Conservation of Natural Springs

The main objective of conservation of natural springs is to make maximum use of its groundwater storage capacity, while sustaining it as an actively functional spring for a long period. While no serious attempts have been made so far to conserve the majority of springs in the country, at least some have been conserved either by local authorities or local community or private parties. For example, source area of the popular natural spring "Gonamariyawa" at Kebithigollewa DS Division is completely covered with

Pandanus and rare medicinal herbs, which helps conservation of the springs (Plate 1). Some springs situated on private land have been conserved by private parties other than the land owner. Very often, private parties have conserved springs on crown land and allowed the public to use water for domestic and bathing purposes, while they used the overflow to cultivate paddy, etc.

Although, it is generally conceded that springs located on private land belong to the land owner who is entitled to use it all by himself, the local traditions restrict the owner from exercising his rights of ownership by allowing peaceful utilization of the available spring water by the local community and the public, for meeting their basic needs such as drinking, bathing and washing with the consent of the owner (Arumugam and Ranatunga, 1974).

With the development of the tea industry in the hill country, a large number of springs would have been destroyed or some have been damaged. Subsequently, with the afforestation program implemented on uneconomic tea lands, an extensive area of the hill country has been planted with Pinus trees, restricting percolation of rain water into the deep soil to recharge the groundwater. It is notable that the disappearance of so many natural springs and lowering of groundwater table has adversely affected the water resources in and around the hill country, experiencing severe water scarcities during non-rainy periods. Stripping soil or clearing natural growth in the vicinity of a spring could easily reduce the water flow to a trickle.

In certain areas, excavation of pits for gem mining could adversely affect spring water flow and in the hill country, many springs are threatened with extinction as their catchment area is being deforested for timber and fuel wood. In Badulla District, it was reported that water flow from 20 springs on crown land was fast dwindling, as a result of clearing the source area for cultivation by "Chena" farmers, causing great harm to the environment as well as large section of the community.

For the above reasons, source of the spring and its vicinity should be well protected by demarcating an area of about half to two acres as a reservation and fencing the area by barbed wire or live fence with an entry point and protecting it by maintaining a natural vegetation of trees and shrubs. The wet season overflow of water from the spring could be collected by constructing a "Wewa" or small tank to include all vents of a spring or by constructing a community well. This practice will maximize the underground water storage and reduce wastage and permits the use of spring water by the local community or public.

7. Need for Legislation

The enactment of legislation is needed for effective conservation of a spring and more equitable distribution of the available spring water. Unless effective measures are introduced to safeguard and protect our natural springs, we shall not be able to sustain our water resources in the future. All springs on private land must be declared by law to be the property of the State, as done by other countries.

The existing laws and government machinery seem to be adequate to provide protection to the springs and source area, as outlined below:

(a) Under the Crown Land Ordinance Section 40 (2), Ministry can declare source area of a spring as a crown reservation for the protection of a spring, and regulations can be made for the use of spring water.

(b) Section 70 of the Penal Code makes provision for a Police Officer to prosecute any person who intently pollute the water of any public spring and render it unfit for use.

(c) Under Section 8 (9) of the Land Development Ordinance, crown land could be mapped out for the protection of a spring and grant authority to use water from the spring.

(d) Under the Land Acquisition Ordinance, it is possible to acquire private land for the protection of a spring and source area and declare it as a crown reservation.

(e) Under the Soil Conservation Act, it is possible to advice the private land owner to reserve an area for the conservation of a spring and to restrict the land owner from cultivating the land.

Therefore, practice of clearing the natural vegetation and cultivating the spring reservation area, encroachment, disturbing the soil and flow of water should be arrested. Furthermore, laws should be enforced to prevent people from blocking and suppressing the vents of a spring with stones or logs; removing soil, rock or other material from the vicinity of a spring; dumping refuse or other solid waste, illegal tapping or over-exploiting spring water by the industry and private parties; leasing the source area of a spring on private land for cultivation; and deforestation and land degradation of catchment area by "Chena" cultivators.

8. Conclusion

In rural areas, only about 10% of the households have access to pipe-borne water. Inadequacy of water supply and poor quality of surface and ground water are the main issues in rural areas. It has been revealed that the existing springs, which are so vital to the well-being of rural people, have been, in most cases, left unprotected and uncared for and not be exploited enough to address the scarcity of safe drinking water supplies to the local

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Contd. from page 39

community. Therefore, more attention should be focused (Niyandagoda, 2008), in the future, on natural springs as a potential water source for the rural community. In this regard, the Water Resources Board has initiated a program titled "Restoration of Clean Water Centers and under this program, action has been taken towards the conservation and protection of natural springs and other potential water sources.

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