DOI:10.5958/2250-0138.2018.00012.3 Received: 25-03-2018 Accepted: 07-08-2018

Indian J.Sci.Res. 09 (1): 65-69, 2018 Review Article ISSN: 0976-2876 (Print)
ISSN: 2250-0138 (Online)

PATALAGANGA PROJECT -AGAINST HYDROGEOLOGICAL CHARACTERISTICS OF KARNATAKA, INDIA

G.V. HEGDE[a1] AND K. C. SUBHASH CHANDRA[b]

[a]Geokuteer, Adarshanagar, 3rd Cross, College Road, Sirsi,India

[b]Ganga Block', Goodwill Apartments, Chandra Layout, Bengaluru,India

ABSTRACT

The proposal of 'Water Quest Hydroresources Management Limited (WQH)' to tap water through deep bore wells from concept based resources located deep in the earth crust as 'Water Veins/Underground Rivers' was for its consideration by the Government of Karnataka (GoK) as 'Patala Ganga project' during 2017. Based on the details available, a scientific evaluation of the viability or otherwise of the project in Karnataka is presented in this paper.The evaluation carried out has revealed that the reasoning of WQH about the concept of perennial water veins/Underground Rivers at depths beyond 300-800m, from seawater distillate as a source and trans-continental water veins flow is not scientific, in view of the geological, geomorphological, hydrogeological and structural features of the State. Groundwater occurring in the State is attributed mainly to dynamic and/or static resources of meteoric origin in the composite aquifer system, but not from the source as contemplated by WQH. The proposed Patala Ganga project in Karnataka is not feasible for sustainable long term supply of water from such sources.

KEY WORDS: Seawater Distillate, Perennial Water Veins, Composite Aquifer, Meteoric Water

The 'Water Quest Hydroresources Management Limited (WQH, 2017)' have put forth a concept to tap water through deep bore wells from 'Water Veins/Underground Rivers' which states "seawater distillate is natural fresh water formed by the seawater continuously flowing by gravity along fractures across hundreds of kilometre within the continental crust at a depth of around six kilometre, thus generating an inexhaustible supply of steam when temperature exceeds around 150^0c. With the salt/minerals settling at the bottom of the fractures, the steam generated moves upwards along pores, fractures and sinkholes of the geological formations encountered, to condense as seawater distillate capped by some impervious formation typically at the depth of 300-800 meters. This seawater distillate may dissolve some chemical constituents from the geological formations through which it passes. The seawater distillate can traverse continents in the form of perennial water veins (Jalanadis), at the said depth of 300-800 meters. Seawater Distillate is not dependent of rain or typical groundwater recharge. These are self-recharging and self-replenishing water sources.

Table:1 Details of locations identified by WQH in Karnataka

Town/Village	Distance Town/Village(km)	Flow Rate(m^3/hr)	Depth(m)	Water Output(MLD)	
				Min	Max
Indi	<11	75-110	370-640	1.65	2.42
Aland	<09	90-120	370-600	1.98	2.62
Shrinivasapur	<06	85-97	330-460	1.87	2.64
Pavagada	<4.5	85-120	340-400	1.87	2.64
Chikkanayakanahalli	<10.2	65-95	330-510	1.43	2.09
Sidlaghatta	<3.8	70-115	330-580	1.54	2.53
Challakere	<8.6	78-110	280-440	1.72	2.42
Anekal	<7.5	60-130	350-540	1.32	2.86

[1]Corresponding Author

Beladadi	<10	75-115	280-630	1.65	2.53
Nabhapur	<8.7	80-110	330-650	1.76	2.42
Mahaligapur	<4.6	90-115	340-500	1.98	2.53
Tirlpur	<7.2	87-110	370-480	1.91	2.42
Annigeri	<11	75-125	310-620	1.65	2.75

The Rural Development and Panchayat Raj (RDPR) Department, Government of Karnataka(GoK), convened a meeting on May 15, 2017(Sawkar, 2017) to discuss about its implementation as 'Patala Ganga' project in Karnataka. In the said meeting, RDPR minister informed about the intention of the Government to consider the WQH proposal for taking further action. A scientific evaluation of the project proposal based on hydrogeological characteristics of Karnataka is presented in this paper.

Geomorphological and Geological Characteristics

Geologically, Karnataka can be classified into the Western Coastal belt, the Western Ghats (WG) and the eastern plains. The WG also marks a climatic divide between the Coastal belt and eastern plains. The eastern plains are further divided into northern and southern plains. The westerly and easterly flowing rivers take their origin in the lofty hill ranges of WG. Based on the rainfall distribution, soil types and cropping pattern, the State has been divided into ten agro-climatic zones.

Geologically, Archaean gneisses, granites and meta-sedimentary schistose rocks are vastly represented in the southern and central parts of the State. Late Archaean Closepet Granite (CG) in the eastern part extends in N-S direction over a length of 500 km with an average width of 30 km from Ramanagaram in the south and beyond Bellary in the north. The CG marks the line of accretion between the Western DharwarCraton(WDC) and the eastern Dharwar Craton (EDC). The proterozoic Kaladgi, Bhima and Badami series of sedimentary rocks and Deccan basalts of cretaceous period are predominant in the northern parts. Laterites of recent age capping these rocks are not uncommon. Basic dykes of varying dimension trending N-S and E-W are common. Narrow strip of alluvial deposits occur along the coast and Major River banks. Thus most part of the State is constituted by hard rock (Figure1).

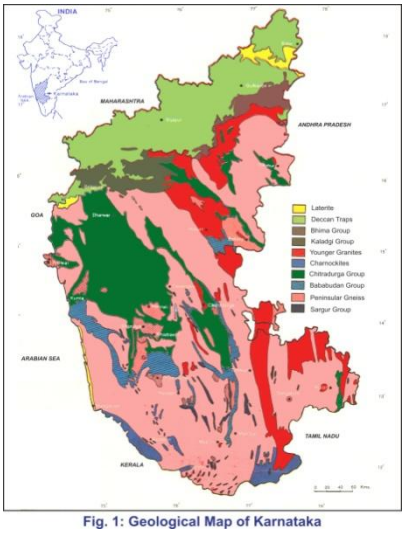

Fig. 1: Geological Map of Karnataka

Table:2 Evaluation of WQH concept

WQH concept	Evaluation by Authors
The sea water flows by gravity along the fractures across hundreds of kilometre land inward at around 06 km depth.	Sea water flow across hundreds of km land inward at around 06km depth requires uninterrupted conduits. It is unlikely owing to the uplifted coast parallel WG and EG hill ranges and major lineaments trending NNW-SSE direction in the west and NNE-SSW in the east respectively. Further E-W fractures are not extending from the eastern plains beyond WG into the Arabian Sea. Western and Eastern Ghats and

	the coast parallel lineaments prevent 'land inward flow of sea water'. Hence such a concept is not acceptable.
Where the temperature exceeds 150°c, steam is generated to produce 'sea water distillate'. WQH claims the generated steam moves upwards along pores, fractures and sink holes of the geological formations including in hard rock areas to condense and travel in the form of perennial water veins (JalaNadi), capped by impervious formation at depth of 300-800m and is purported to be detected from the surface by using certain proprietary vertical prospecting techniques developed by WQH.	The geothermal temperature increases by 3°c per 100m depth. With this analogy, it can be inferred that to attain the temperature of 150°c, the depth required is 5000m (05km). At such a depth there cannot be any pores, fractures, sink holes and permeable rock matrix in hard, massive igneous and metamorphic Archaean basement terrain beyond 300m depth. Hence upward movement of steam, its condensation and travel in the form of perennial water veins are beyond scientific reasoning. Studies carried out by various research institutes, universities, State/Central Groundwater departments, the data obtained and evaluated by the authors about agricultural and non-agricultural bore wells drilled in the State have revealed that the potential fractures are limited to 300m depth. Further, because of massiveness, non-porosity and non-permeability, rocks are non-aquifer beyond an average depth of 300m. Contradicting to their own inference of impervious rock formation at depth of 300 to 800m, WQH have recommended bore well drilling between 280 and 650m (Table 1). Bore wells drilled beyond 500-600m depth in Karnataka, have not remained sustainable because surface water infiltrated and percolated into composite aquifer system is the only source of water for bore wells in hard rock terrains of the State.
WQH claims to pump fresh water from the identified, drilled, constructed bore wells round the clock on sustainable basis at the rate of 80,000 to 1,20,000 litres per hour (80-120m^3/h).	As already discussed, water availability between 280 and 650m is of meteoric origin and not the seawater distillate to yield round the clock on sustainable basis so claimed by WQH.
Natural percolation of sea water through fault lines, fissures, fractures of the oceanic crust to deeper recesses, where temperature could range 500-800^{0}c, transforming sea water into steam using geothermal heat. The steam which is under very high pressure is able to rise to shallower zones and starts to condense into moving water veins or Underground Rivers	In the context of Karnataka geological, geomorphological and structural features (NNW-SSE Coast parallel lineaments, almost N-S trending CG separating EDC from WDC and absence of E-W fractures from the eastern plains through Ghats into Sea), constrains subsurface flow of sea water from west to east or east to west. With this background, it is opined that the presence of 'moving water veins or Underground Rivers' at depths as presented by WQH is illusionary.
These water veins flow is trans-continental, naturally desalinated and self-replenishing without impacting underground water table.	The continental drift and plate tectonic theory do not support such concept of trans-continental 'moving water veins or Underground Rivers'. The mechanism advocated by WQH about natural desalination and self-replenishment of water veins is not in accordance with hydrogeological principles.

The State forming part of the Southern Peninsula is dominated by NNW-SSE, NW-SE and less prominent ENE-WSW, NE-SW lineaments. Based on Landsat imagery studies, Srinivasan and Srinivas(1977) have reported geological and structural features of Karnataka. Ganesh Raj(1994),opined that N15°-25°W lineaments which are parallel to the West Coast are sympathetic to west coast fault. The survey of literature has not revealed information in regard to depth extension of these lineaments. A narrow N-S trending shear zone correlated with east dipping thrust revealed by deep seismic sounding acts as boundary between the western and eastern blocks of Karnataka Craton (Kaila,1979).

Hydro-Geological Conditions

Hydro-geologically, under normal conditions, rain water that infiltrates into soil zone, percolate into the upper weathered and/or fractured rock zones, forms groundwater. These rocks are generally weathered up to 20-30m depth. Normally at greater depths, the rocks are distinctly less fractured. In a hard rock terrain, the unconfined, semi-unconfined and semi-confined conditions form a composite aquifer system. Below an average depth of 300m these rocks become massive and due to the absence of joints/fractures and inter-granular porosity and permeability become non aquifer. Bore wells drilled in the districts of Kolar, Bengaluru Urban, Bengaluru Rural, Ramanagara, Tumakuru, Chitradurga etc., for agricultural and non-agricultural purposes, up to 500-600m depth have yielded no water beyond 300m except in certain cases of structurally disturbed zones (Subhash Chandra and Hegde, 2015).

DISCUSSION

Proposal of WQH about the availability and tapping of 'Seawater Distillate' at depths between 300-800m in context of Karnataka are hereby discussed.

The conceptual diagram presented by WQH to GoK indicates occurrence of impermeable rocks below the oceanic crust and permeable rocks at greater depths in the continental crustal parts above the magmatic zone. WQH reports that, "seawater distillate is natural fresh water formed by the seawater continuously flowing by gravity along fractures across hundreds of kilometre within the continental crust at a depth of around six km, thus generating an inexhaustible supply of steam when temperature exceeds around 150^0c.

WQH reported to have identified the water veins in a few locations and the details furnished to GoK are given in Table-1.

Table-1 reveals that the identified sites are varying from less than 3.8 km to -11km distance away from the places mentioned. The flow rate estimated is at 60-130m^3/h with variable yield between 1.3-2.86 million litres per day (MLD) at depths between 280-650m.

The concept of WQH in regard to 'sea water distillate' and 'water veins or Underground Rivers' are evaluated and given in Table-2.

CONCLUSION

The following significant points emerge out from the above discussions on the concept of WQH about perennial water veins/Underground Rivers at depths between 300-800m, from seawater distillate as a source:

- Geological, geomorphological, hydrogeological and structural features of the State do not support transmission of sea water across hundreds of kilometre land-inward at various depths.
- Though water yielding potential fractures is limited to 300m depth, bore wells attempted in the State beyond 500-600m have not remained sustainable.
- The concept of WQH about the mechanism of 'percolation of sea water to a deeper level, formation of sea water distillate and generation of Water Veins/Underground Rivers at shallow depth' is only hypothetical. Such a condition is not a possibility in the hard rock terrains of Karnataka and hence occurrence of pockets of sea water distillate as perennial source for self-replenishing, self-recharging water veins/ underground rivers finds no scientific reasoning.
- Groundwater in the target locations (Table-1), are attributed to static groundwater resources of meteoric origin in the composite aquifer system, but not from the source as contemplated by WQH.
- The concept of trans-continental water veins flow does not find any merit in the context of Karnataka and finds no scientific merit even to mitigate acute water supply problems.

REFERENCES

Ganesh Raj, K., 1994: Major Lineaments of Karnataka and their Significance, Geo Karnataka,MGD Centenary :303-313.

Kaila, K.L., 1979: Crustal structures along Kavali-Udupi profile in the Indian Peninsular Shieldfrom Deep Seismic Sounding, Jour.Geol.Soc. India, 20, 307-333.

Srinivasan, R. and Sreenivas, B.L., 1977: Some new geological features from the Landsat imagery of Karnataka, Jour.Geol.Soc. India, 18, 589-597.

Subhash Chandra, K.C. and Hegde, G.V., 2015: Bengaluru Water Resource Management-Challenges and Remedies, INCERT, Bengaluru, ISBN 81-89650-51-3, 43-54.

Swakar, R.H., 2017: Source of groundwater and sea water distillate(PatalaGange): Are they same or different: News and notes, Jour.Geol.Soc.India, **90**, 121-123.

WQH (2017): https://www.waterquestresources.com/accessed on 23/07/2018.