SAWA PGD Fellow	:	*Shovana Maharjan*
Institution	:	*NEC*
Title	:	*Inter-Linkage between Groundwater and Surface Water Sources along Dhobikhola River Corridor and its Health and Livelihood Implications*
Email	:	*dibeshshrestha@live.com*

Background

Growing population and water need of the Kathmandu valley coupled with incapability of the concerned authorities to supply the water have led Kathmanduites to extract underground water in huge quantities by means of dug wells, tube wells and bore wells. Thus, groundwater has been the most dependent water source in the valley despite its quality. In addition to the higher extraction rate than recharge, valley surface concretization has left the river water to recharge the shallow groundwater. It is because the surface water and groundwater are interconnected resources and their occurrence is linked to the hydrologic processes at the local level. Depending on the hydraulic effect, groundwater may supplement water to river and surface water may replenish water to nearby aquifer. In such a condition, if river water is polluted, then there is a higher probability of groundwater being contaminated. Consumption of such water may cause an adverse effect on health. This study attempts to look into the possible contamination of groundwater as a result of river water quality in Dhobikhola corridor and establish the linkages of the groundwater contamination with the health and livelihood of the people living along the river.

Research Objectives

The overall objective of this study is to explore the possible interaction and interrelationship between surface water and groundwater in the river corridor of Dhobikhola, pattern of groundwater use and the emerging livelihood consequences to the people living along the river corridor.

Research Methodology

Two kinds of approaches were used in the collection of relevant information, i) collection of primary data through laboratory analysis of groundwater and surface water samples for four consecutive months (June-September) and households survey, and ii) collection of secondary sources of information, to the extent of needs, to substantiate the results obtained from the analysis of primary data. The study area, Dhobikhola River has been divided into 3 zones based on the economic strata of people living in those areas. Surface water samples were collected from the three zones by grab sampling technique whereas purposive samples of groundwater were collected from predetermined groundwater sources, such as tube well, dug well and rower pumps, located on both sides of the river course within a distance of 100 m.

Research Findings

The study showed that the river becomes extremely polluted as it flows down the path. The groundwater samples were also found to be contaminated. About 53% of the groundwater samples collected during all the four months contained fecal coliform above 8000 CFU/100 ml. Only one sampling site contains zero fecal coliform. BOD, COD, nitrate, ammonia and iron exceed the WHO water quality guidelines. Fecal coliform level was found to be higher in Dug well than in other sources, which may be because wells are only occasionally covered and the unhygienic practice of people around the well. Due to hydraulic effect of the river coupled with the hydro-geological formation of the area, polluted river water has higher probability to percolate into shallow groundwater aquifer. However, a weak relationship between groundwater and surface water has been observed. Along with this, external factors of groundwater contamination are leakage of leachate from solid waste, infiltration and percolation of contaminants and chemical fertilizer from upper surface.

Household survey from 36 respondents revealed that majority (69%) of the households apart from KUKL's water supply system was also using groundwater to meet part of the domestic needs. In these households, use of KUKL's water supply was primarily for drinking while groundwater was found used in cleaning, washing, and sanitary uses and in the kitchen garden. Almost every household have either a dug well or a shallow tube well. Largest numbers (53%) of the households were found extracting groundwater from shallow tube wells with the depth ranging between 1.52-14.02 m. On an average, people living along Dhobikhola River extract 1091.91 liters of groundwater daily to supplement the water needs. Treatment of groundwater for domestic uses was noted only in 8 out of 36 (22%) of the households while remaining 78% of the households did not practice any treatment of groundwater, whatsoever. People are extracting more groundwater and their dependence is increasing as it is more cost effective than buying private water tanker or mineral water bottles. No health impact due to groundwater use have been reported from the people, but if concentration of the contaminants keeps increasing, the water can cause negative impact on health after some time.

Conclusions

The study showed that the Dhobikhola River is very polluted; the pollution level increases from upstream to downstream due to addition of more biological waste along its way. During rainy season ie., August, the values are less due to dilution effect of the river water.

Due to hydraulic effect of the river coupled with the hydro-geological formation of the area, polluted river water has higher probability to percolate into shallow groundwater aquifer. Along with this, external factors of groundwater contamination are leakage of leachate from solid waste dumping, infiltration and percolation of contaminants and chemical fertilizers form upper surface. The groundwater extraction is very high as water supply is not adequate to last throughout the year. Presence of fecal colifom in water indicates that, groundwater is not suitable for drinking without treatment. Groundwater extraction technology range from simple to complex technologies and also to varying depth, in dug well, tube well and fluctuation of water during different months were not measured. The extraction may result in the decline of groundwater table, such that it might be lower than that of river water. Due to which, river water may flow into the groundwater source contaminating it as well, because of higher permeability and transmissivity of the land surface along Dhobikhola River corridor.