THESIS

# WATER QUALITY MONITORING OF HUDIARA DRAIN AND ITS IMPACTS ON GROUNDWATER AND HUMAN HEALTH

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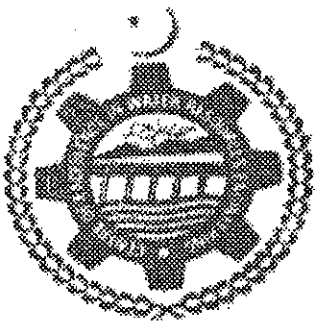


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## ABSTRACT

With many developing countries there are major environmental issue in Pakistan that require detail research to enable regulatory bodies to impose guidelines for the protection of our environment. The industrial effluents and wastewater generated in human settlements are disposed of directly into drains, river bodies and agriculture field throughout the country. Most wastewater contains pollutants, which may deteriorate the quality of receiving water bodies and harm associated aquatic life. There is also concern about possible long term effect on the quality of under groundwater (being used for drinking and other households).

The present study monitored the water quality of Hudiara drain (a tributary of Ravi River), which originates in India and enters Pakistan near *Lalloo* village. It also assessed the impact of drain's water on under groundwater quality. A community based case control epidemiological study was another component of this study. The overall objective was to develop such recommendations that can be helped to keep our water bodies safe from the dangerous limits of pollution.

18 water samples (drain's water) from three different sampling points were collected on fortnightly basis from April 2005 to September 2005 for testing water quality parameters. Three water samples were collected of under groundwater (from hand pumps, which are mostly used as drinking water) from the village *Thether*, situated along Hudiara drain. For an empidemological study, two villages, *Thether* (case) and *Panghali* (control) were selected. Both villages have comparable economical, social, cultural and educational backgrounds.

Large variations were found in almost all water quality indices with most of the lower values being observed during monsoon season (July to September). Mean dissolved oxygen (DO) was below 1 mg/l at all sampling points. Mean BOD (biochemical Oxygen Deman) was 104-115 mg/l and COD ()Chemical Oxygen Demand) 255-276 mg/l values exceeded the NEQS (National Environmental Quality Standards of Pakistan) for Industrial effluents. Although mean total dissolved solids (TDS) and metal concentrations (Cd, Cr, Cu, Li, Mn and Pb) of the drain's water were below the limits set for industrial effluents (NEQS), concentration of most of these indices (e.g. TDS, Cd, Cu & Mn) were above the acceptable limits of irrigation water.

E-coli in all water samples were greater than 180 MPN/100 ml. The daily contribution of total pollution load of the Hudiara drain to the Ravi in terms of TDS, BOD & COD was 354 tons, 45 tons and 111 tons respectively.

Long term pollution in Hudiara drain's water proved harmful for human health as due to this, the under groundwater (drinking water) have become bacteriologically contaminated along the stretch of Hudiara drain. Prevalence of eye and skin diseases and diarrhea, dysentery, joint pains and other abdominal diseases were higher in *Thether* (case village) diseases were higher in *Thether* (case village) compare to the control village (*Panghali*). Similarly, the average blood lead (Pb) level was in general greater in the sampled individuals of the case village than the control village. The greater incidence of these diseases in the Thethar village may be partly attributed to frequent direct and indirect contacts of villages with polluted drain water as well as contaminated drinking water (under groundwater). With an annual discharge of approximately 180 cusecs, the Hudiara drain is one of the main causes of both chemical and biological contamination in the river Ravi. Poor water quality and stress aquatic life in the river Ravi, especially drinking low flow may be largely attributed to the Hudiara Drain.